```
?
File  15:ABI/Inform(R) 1971-2005/May 14
         (c) 2005 ProQuest Info&Learning
File  16:Gale Group PROMT(R) 1990-2005/May 13
         (c) 2005 The Gale Group
File 148:Gale Group Trade & Industry DB 1976-2005/May 16
         (c)2005 The Gale Group
File 160:Gale Group PROMT(R) 1972-1989
         (c) 1999 The Gale Group
File 275:Gale Group Computer DB(TM) 1983-2005/May 16
         (c) 2005 The Gale Group
File 621:Gale Group New Prod.Annou.(R) 1985-2005/May 16
         (c) 2005 The Gale Group
File 626:Bond Buyer Full Text 1981-2005/May 16
         (c) 2005 Bond Buyer
File 608:KR/T Bus.News. 1992-2005/May 16
         (c)2005 Knight Ridder/Tribune Bus News
File   9:Business & Industry(R) Jul/1994-2005/May 13
         (c) 2005  The Gale Group
File  20:Dialog Global Reporter 1997-2005/May 16
         (c) 2005 The Dialog Corp.
File 623:Business Week 1985-2005/May 12
         (c) 2005 The McGraw-Hill Companies Inc
File 624:McGraw-Hill Publications 1985-2005/May 12
         (c) 2005 McGraw-Hill Co. Inc
File 636:Gale Group Newsletter DB(TM) 1987-2005/May 16
         (c) 2005 The Gale Group
File 813:PR Newswire 1987-1999/Apr 30
         (c) 1999 PR Newswire Association Inc
File 810:Business Wire 1986-1999/Feb 28
         (c) 1999 Business Wire
File 610:Business Wire 1999-2005/May 16
         (c) 2005 Business Wire.
File 476:Financial Times Fulltext 1982-2005/May 16
         (c) 2005 Financial Times Ltd
File 613:PR Newswire 1999-2005/May 16
         (c) 2005 PR Newswire Association Inc
File 634:San Jose Mercury  Jun 1985-2005/May 14
         (c) 2005 San Jose Mercury News
File 625:American Banker Publications 1981-2005/May 16
         (c) 2005 American Banker
```

Set	Items	Description
S1	5935027	BID? OR BIDDING OR AUCTION OR AUCTIONING OR MATCHING OR MA-TCH
S2	1503525	SAMPLE OR SAMPLING
S3	5966	RANDOM (N) NUMBER
S4	0	MAKERT (N) (PRICE OR VALUE OR COST)
S5	148332	BASELINE
S6	244142	THRESHOLD
S7	1735193	RESERVE
S8	608573	MARKET () (PRICE OR VALUE OR COST)
S9	0	S1(S)S2(S)S3(S)S8(S)S6
S10	13	S1(S)S2(S)S3
~~S11~~	~~10~~	RD (unique items)
~~S12~~	~~1~~	S1(S)S2(S)S8(S)S6
~~S13~~	~~1~~	S1(S)S2(S)S5(S)S6
~~S14~~	~~2~~	S1(S)S2(S)S6(S)S7

reviewed

?

?

```
File   2:INSPEC 1969-2005/May W2
         (c) 2005 Institution of Electrical Engineers
File  65:Inside Conferences 1993-2005/May W2
         (c) 2005 BLDSC all rts. reserv.
File  99:Wilson Appl. Sci & Tech Abs 1983-2005/Apr
         (c) 2005 The HW Wilson Co.
File 583:Gale Group Globalbase(TM) 1986-2002/Dec 13
         (c) 2002 The Gale Group
File  35:Dissertation Abs Online 1861-2005/Apr
         (c) 2005 ProQuest Info&Learning
File 474:New York Times Abs 1969-2005/May 13
         (c) 2005 The New York Times
File 475:Wall Street Journal Abs 1973-2005/May 13
         (c) 2005 The New York Times
File 169:Insurance Periodicals 1984-1999/Nov 15
         (c) 1999 NILS Publishing Co.
File 139:EconLit 1969-2005/May
         (c) 2005 American Economic Association
```

Set	Items	Description
S1	331546	BID? OR BIDDING OR AUCTION OR AUCTIONING OR MATCHING OR MA-TCH
S2	440592	SAMPLE OR SAMPLING
S3	4006	RANDOM (N) NUMBER
S4	0	MAKERT (N) (PRICE OR VALUE OR COST)
S5	30099	BASELINE
S6	156661	THRESHOLD
S7	53098	RESERVE
S8	10462	MARKET () (PRICE OR VALUE OR COST)
S9	7435	S1 AND S2
S10	9	S9 AND S3
reviewed S11	9	RD (unique items)
S12	0	S9 AND S5 AND S6
S13	0	S9 AND S6 AND S7 AND S8
S14	0	S9 AND S6 AND S7
S15	96	S9 AND S6
reviewed S16	1	S15 AND S8

?

```
File 348:EUROPEAN PATENTS 1978-2005/May W02
         (c) 2005 European Patent Office
File 349:PCT FULLTEXT 1979-2005/UB=20050512,UT=20050505
         (c) 2005 WIPO/Univentio
File 347:JAPIO Nov 1976-2005/Jan(Updated 050506)
         (c) 2005 JPO & JAPIO

Set     Items    Description
S1     315440    BID? OR BIDDING OR AUCTION OR AUCTIONING OR MATCHING OR MA-
               TCH
S2     453534    SAMPLE OR SAMPLING
S3      14393    RANDOM (N) NUMBER
S4          0    MAKERT (N) (PRICE OR VALUE OR COST)
S5      31678    BASELINE
S6     196596    THRESHOLD
S7      38698    RESERVE
S8       2131    MARKET () (PRICE OR VALUE OR COST)
S9         79    S1 AND S2 AND S3 AND S5 AND S6
S10         1    S9 AND S8
S11         8    S1 AND S2 AND S3 AND S6 AND S8
?
```

reviewed

11/K/1 (Item 1 from file: 15)

02799965 674399141
USE FORMAT 7 OR 9 FOR FULL TEXT
Artificial neural networks, classification trees and regression: Which method for which customer base? WORD COUNT: 5454 LENGTH: 13 Pages
Jul 2004

DESCRIPTORS: Market research; Target markets; Methods; Regression analysis; Neural networks; Comparative studies; Statistical analysis; Data base marketing; Classification
CLASSIFICATION CODES: 9130 (CN=Experimental/Theoretical); 7100 (CN=Market research); 5240 (CN=Software & systems)
PRINT MEDIA ID: 49220

...TEXT: mailing.

Simulation

For these databases, the sociodemographic/geographic data "was taken from a random sub- **sample** of an anonymous data collection of a real Swiss population. The purchase history data was...
...turnover, purchase frequency and recency of last purchase. These variables were created by use of **random - number** generators built into SAS statistical software.7 In order to render the distributions of the simulated purchase history variables less well-behaved than the output from the **random number** generator - and thus more challenging for the later analysis - multiple random distributions (normal and/or...

...final distribution of the variables. The distributions were created so far as possible as to **match** the authors' experience with real patterns.

Experimental design

The second step in data simulation was...

11/K/2 (Item 2 from file: 15)

02782077 687957331
USE FORMAT 7 OR 9 FOR FULL TEXT
REIT and REOC Systematic Risk Sensitivity WORD COUNT: 5029 LENGTH: 18 Pages
Jul-Sep 2004

DESCRIPTORS: Studies; REITs; Real estate companies; Risk
CLASSIFICATION CODES: 9130 (CN=Experimental/Theoretical); 8360 (CN=Real estate); 3400 (CN=Investment analysis & personal finance)
PRINT MEDIA ID: 11189

...TEXT: stock valuations were nearing their peak. The next step is to create a more comparable **sample** considering the fact that the investments of these REOCs are predominantly hotel/motel related. The **sample** contains all fourteen publicly traded hotel/motel REITs. Fearing low degrees-of-freedom problems, a **random number** generator was used to select REITs randomly until the subsample contained REITs with 46% of their funds invested in hotel/motel assets so as to **match** the REOC **sample** 's hotel/motel property concentration. This REIT subsample contains thirty-two firms. Therefore, the **sample** has thirty-two REITs and twenty-three REOCs, but with approximately the same hotel/motel...

11/K/3 (Item 3 from file: 15)

02302215 67166601
USE FORMAT 7 OR 9 FOR FULL TEXT
E-surveying for tourism research: Legitimate tool or a researcher's fantasy? WORD COUNT: 4952 LENGTH: 7 Pages
Feb 2001
GEOGRAPHIC NAMES: United States; US

DESCRIPTORS: Tourism; Data collection; Studies; Methods; Statistical analysis; Internet; Electronic mail systems; Market research
CLASSIFICATION CODES: 9190 (CN=United States); 8350 (CN=Transportation & travel industry); 9130 (CN=Experimental/Theoretical); 7100 (CN=Market research); 5250 (CN=Telecommunications systems & Internet communications)
PRINT MEDIA ID: 14851

...TEXT: five percent of respondents were Singaporeans. (See Table 1 for full demographic disclosure.)

The second **sample** was collected via e-mail, with the goal of obtaining responses from approximately the same...
...of e-mail addresses, yielded 237 usable responses. To find these 2,000 addresses, a **random number** table was used to select names from the Singapore telephone directory. For each name selected...

...It was not expected that exact matches would necessarily be found. When no exact name **match** was found, as was often the case, or when a selected common name yielded multiple...

11/K/4 (Item 4 from file: 15)

00891203 95-40595
USE FORMAT 7 OR 9 FOR FULL TEXT
Perceptions of meat and food: Some implications for health promotion strategies WORD COUNT: 4268 LENGTH: 7 Pages
1994
GEOGRAPHIC NAMES: UK

DESCRIPTORS: Attitude surveys; Consumer attitudes; Implications; Meat products; Food products; Correlation analysis; Comparative studies; Public health
CLASSIFICATION CODES: 7100 (CN=Market research); 9175 (CN=Western Europe); 8610 (CN=Food processing industry); 1200 (CN=Social policy)

...TEXT: in the Norwich and District telephone directory. While there are arguments against this as a **sampling** frame for a general population, e.g.[13,14], it was felt important that, as a local authority, accountability (and hence certain accessibility) was maintained. The **sample** consisted of 94 people of varying age, socio-economic class[15] and were selected in two stages by **random number** generation. The **sample** profile did not fully **match** that found by the 1981 National Census for Norwich[16]. The two groups are compared...
...was felt, however, that the random selection would still provide meaningful information (see discussion). The **sample** had a mean age in the band 36-50 years. Sixty were women and 34...

11/K/5 (Item 5 from file: 15)

00850833 95-00225
USE FORMAT 7 OR 9 FOR FULL TEXT
Plan, market and regulatory considerations in HMO insolvency prediction
WORD COUNT: 5516 LENGTH: 18 Pages

Spring 1994
GEOGRAPHIC NAMES: US

DESCRIPTORS: Studies; Models; HMOs; Insolvency; Variables
CLASSIFICATION CODES: 9190 (CN=United States); 9130
(CN=Experimental/Theoretical); 8320 (CN=Health care industry); 3200
(CN=Credit management)

...TEXT: systematic differences across organizational form may distort comparison and interpretation of the final results.

The **matching** sample technique has some disadvantages. First, the sample is not truly random as the matched firms are "chosen." This problem was overcome as best as possible by using the **random number** generator to select from the list of solvent HMOs each year. More troublesome is the overrepresentation of insolvent HMOs in the **sample** as compared to the true population. This overrepresentation can lead to biased coefficients depending on...

11/K/6 (Item 1 from file: 16)

06331307 Supplier Number: 54606037 (USE FORMAT 7 FOR FULLTEXT)
Intel Innovates With Integrated Graphics : New 810 Chip Set Combines 3D Acceleration, New Core-Logic Architecture.(includes related article on 752 discrete 3D option)(Product Information)
May 10, 1999
Word Count: 2615
PUBLISHER NAME: Cahners Publishing Company
COMPANY NAMES: *Intel Corp.
EVENT NAMES: *330 (Product information)
GEOGRAPHIC NAMES: *1USA (United States)
PRODUCT NAMES: *3674124 (Microprocessor Chips)
INDUSTRY NAMES: BUSN (Any type of business); CMPT (Computers and Office Automation)
NAICS CODES: 334413 (Semiconductor and Related Device Manufacturing)
TRADE NAMES: Intel 810 (Microprocessor)
SPECIAL FEATURES: COMPANY

(USE FORMAT 7 FOR FULLTEXT)
TEXT:
...Glaskowsky Intel's new 810 chip set combines core logic, graphics, flash memory, and a **random - number** generator. Many of these elements are new-but as for the 810's architecture, it...

...Hub (FWH), which contains flash memory for the system BIOS and a unique new hardware **random - number** generator. The hub architecture allows Intel to mix and **match** components among its chip sets. We expect the 820 (Camino) chip set, due in September...that reduce the overall cost of implementation as well as board area. Flash Chip Features **Random - Number** Generator A unique feature of the 810 is its inclusion of a true **random - number** generator (RNG). Intel announced it was working on RNG technology last fall (see MPR 10...

...Intel recommends using the output of the 810's RNG to seed a conventional pseudo- **random - number** generator (PRNG). By reseeding the PRNG frequently, users can foil any effort to deduce the...applications that stress memory bandwidth, graphics performance, or both may not. Though it can't **match** the performance of discrete solutions, the 810 offers clear advantages in overall cost and system...

...be more competition in this space over the next year. ATI and S3 plan to **sample** core-logic products with integrated graphics by the end of 1999. Since these vendors have...

11/K/7 (Item 1 from file: 148)

09840900 SUPPLIER NUMBER: 19779495 (USE FORMAT 7 OR 9 FOR FULL TEXT)
An analysis of shift rate observed among books housed on the bottom shelves of an academic library.(Sessio Taurino)(humor)(Column)
Summer, 1997
WORD COUNT: 1828 LINE COUNT: 00154

SPECIAL FEATURES: table; illustration
INDUSTRY CODES/NAMES: BUSN Any type of business; LIB Library and Information Science
DESCRIPTORS: Library science--Anecdotes, cartoons, satire, etc.
FILE SEGMENT: TI File 148

... a larger sample of 3,000 books was selected using a random number table and **matching** results to accession numbers. Numbers not found on the bottom shelf or not found at...

11/K/8 (Item 2 from file: 148)

07314179 SUPPLIER NUMBER: 15717387 (USE FORMAT 7 OR 9 FOR FULL TEXT)
Estimating workers' marginal willingness to pay for job attributes using duration data. (includes appendix)
Summer, 1994
WORD COUNT: 8493 LINE COUNT: 00752

SPECIAL FEATURES: illustration; table
INDUSTRY CODES/NAMES: INSR Insurance and Human Resources
DESCRIPTORS: Job hunting--Research; Labor market--Research; Wages--Models
FILE SEGMENT: MC File 75

... Press et al. 1986) allows one to use a random number generator to create a **sample** data set of (w, x) observations from the continuous distribution function [F.sub.j](v...

...z be a randomly generated realization from a uniform distribution having support [0, 1]. We **match** realization z to firm type j according to the function
1, if 0 [is less...

11/K/9 (Item 3 from file: 148)

05927690 SUPPLIER NUMBER: 12630305 (USE FORMAT 7 OR 9 FOR FULL TEXT)
Estimating existence value for users and nonusers of New Jersey beaches.
May, 1992
WORD COUNT: 7566 LINE COUNT: 00614

SPECIAL FEATURES: illustration; table
INDUSTRY CODES/NAMES: REAL Real Estate; ENV Environment
DESCRIPTORS: Beaches--Usage; Land use--Research
FILE SEGMENT: MC File 75

... repeated with the next random number and so forth. (7) The WTP questions followed a **bidding** game format. Respondents were randomly assigned one of three starting **bids** . Starting points for the recreation use WTP were $2, $4, or $6 with a 50 cent **bidding** increment (decrement). Starting **bids** for the existence value were $10, $20, or $30 with a $5 **bidding** increment (decrement). A pretest provided the information for selecting the starting point **bids** . At the time of the survey design, 1983, a **bidding** game format was widely used in CVM studies. It is well

known today that **bidding** games result in starting point bias (Boyle, Bishop, and Welsh 1985; Mitchell and Carson 1989...
...of the survey was 11 counties in Northern New Jersey and Staten Island. A random **sample** of active residential telephone numbers was obtained from Survey **Sampling** , Inc., located in Fairfield, Connecticut. The ideal situation is to have the percentage of respondents from each county **match** the percentage of the total population from each county. This was the case for eight...

...statement can be made regarding the existence or nonexistence of sequencing." Furthermore, Brookshire's small **sample** sizes raise doubt of the extent of sequencing that was uncovered. Boyle, Reiling, and Phillips ...

...positive dollar value. These questions were asked immediately after respondents bad answered the existence value **bid** question. A series of fixed response categories were presented along with an open-ended category ...

...the specified categories. A response was classified as "valid" if the respondent stated "that is (**bid** amount) what it (existence value of the beach) is worth to me," or "the existence...

...did not want to place a dollar value, not enough information) were classified as protest **bids** . Protest **bids** , including postive and zero amounts, accounted for 7.2 percent of the **sample** . Zero protest **bids** represented 8.8 percent of all zero **bids** . (14) Greenley, Walsh, and Young (1981) encounter 20 percent zero **bidders** , while Desvousges, Smith, and Fisher (1987) and Sutherland and Walsh (1985) report 36 and 47 percent, respectively. Reiling, Boyle, Cheng, and Phillips (1989) report 57 percent zero **bidders** . (15) Since the distribution of the **bids** is not normal due to a large number of zero **bids** , a t-test of the difference between the two means is not valid. Using the nonparametric Mann-Whitney U test we conclude that the mean **bids** do differ significantly at the 0.05 level. The Mann-Whitney test is used in all comparisons where the zero **bids** are included. (16) It is useful to note that the on-site and telephone surveys ...

...project was verbally described. With respect to the payment vehicle, the onsite survey used starting **bids** while the telephone survey used open-ended **bidding** . Finally, a statement notifying respondents of the budget constraint was included only in the telephone...

...not yield statistically significant results. The lack of a significant model is due to the **sample** size (70 for users and 116 for nonusers) and omitted variable bias. The telephone survey...
...1980) assumes that a percentage of the observed values of the dependent variable (existence value **bid**) are clustered at a limiting value, in this case zero. Respondents are then censured from making a negative **bid** ; instead, responding zero to the existence value question. Bockstael, Strand, McConnell, and Arsanjani (1990) compare...

...observations are censored at zero. They recommend the Tobit model when both the decision to **bid** and the decision on the amount of the **bid** are affected by the same independent variables. Edwards and Anderson (1987) use the Heckman **sample** selection model to examine **sampling** biases in a study of option value. Reiling et al. (1989) use Tobit because ordinary...

...mile stretch of beach somewhere else in New Jersey was analyzed, the resulting existence value **bids** would not be expanded to the same population because distance to the beach is a significant variable in the **bid** function.

References

Amemiya, T. 1973. "Regression Analysis When the Dependent Variable is Truncated Normal." Econometrica...

11/K/10 (Item 4 from file: 148)

05172136 SUPPLIER NUMBER: 10795155 (USE FORMAT 7 OR 9 FOR FULL TEXT)
Inference and optimal design for a welfare measure in dichotomous choice contingent valuation.
May, 1991
WORD COUNT: 8821 LINE COUNT: 00719

SPECIAL FEATURES: illustration; table
INDUSTRY CODES/NAMES: REAL Real Estate; ENV Environment
DESCRIPTORS: Valuation--Technique; Experimental design--Technique; Surveys--Technique
FILE SEGMENT: MC File 75

... the simulations were performed in GLIM (Baker and Nelder 1978) with its built-in uniform **random number** generator.
...
?
File 15:ABI/Inform(R) 1971-2005/May 14
(c) 2005 ProQuest Info&Learning
File 16:Gale Group PROMT(R) 1990-2005/May 13
(c) 2005 The Gale Group
File 148:Gale Group Trade & Industry DB 1976-2005/May 16
(c)2005 The Gale Group
File 160:Gale Group PROMT(R) 1972-1989
(c) 1999 The Gale Group
File 275:Gale Group Computer DB(TM) 1983-2005/May 16
(c) 2005 The Gale Group
File 621:Gale Group New Prod.Annou.(R) 1985-2005/May 16
(c) 2005 The Gale Group
File 626:Bond Buyer Full Text 1981-2005/May 16
(c) 2005 Bond Buyer
File 608:KR/T Bus.News. 1992-2005/May 16
(c)2005 Knight Ridder/Tribune Bus News
File 9:Business & Industry(R) Jul/1994-2005/May 13
(c) 2005 The Gale Group
File 20:Dialog Global Reporter 1997-2005/May 16
(c) 2005 The Dialog Corp.
File 623:Business Week 1985-2005/May 12
(c) 2005 The McGraw-Hill Companies Inc
File 624:McGraw-Hill Publications 1985-2005/May 12
(c) 2005 McGraw-Hill Co. Inc
File 636:Gale Group Newsletter DB(TM) 1987-2005/May 16
(c) 2005 The Gale Group
File 813:PR Newswire 1987-1999/Apr 30
(c) 1999 PR Newswire Association Inc
File 810:Business Wire 1986-1999/Feb 28
(c) 1999 Business Wire
File 610:Business Wire 1999-2005/May 16
(c) 2005 Business Wire.
File 476:Financial Times Fulltext 1982-2005/May 16
(c) 2005 Financial Times Ltd
File 613:PR Newswire 1999-2005/May 16
(c) 2005 PR Newswire Association Inc
File 634:San Jose Mercury Jun 1985-2005/May 14
(c) 2005 San Jose Mercury News
File 625:American Banker Publications 1981-2005/May 16
(c) 2005 American Banker

Set	Items	Description
S1	5935027	BID? OR BIDDING OR AUCTION OR AUCTIONING OR MATCHING OR MA-TCH
S2	1503525	SAMPLE OR SAMPLING
S3	5966	RANDOM (N) NUMBER

```
S4          0   MAKERT (N) (PRICE OR VALUE OR COST)
S5     148332   BASELINE
S6     244142   THRESHOLD
S7    1735193   RESERVE
S8     608573   MARKET () (PRICE OR VALUE OR COST)
S9          0   S1(S)S2(S)S3(S)S8(S)S6
S10        13   S1(S)S2(S)S3
S11        10   RD (unique items)
?
         5935027  S1
         1503525  S2
          608573  S8
          244142  S6
     S12       1  S1(S)S2(S)S8(S)S6
?
```

12/9/1 (Item 1 from file: 15)

DIALOG(R)File 15:ABI/Inform(R)

02727089 623840661

Trading intensity, volatility, and arbitrage activity

Taylor, Nicholas

Journal of Banking & Finance v28n5 PP: 1137-1162 May 2004 CODEN: JBFIDO
ISSN: 0378-4266 JRNL CODE: JBA
DOC TYPE: Periodical; Feature LANGUAGE: English RECORD TYPE: Abstract
GEOGRAPHIC NAMES: United Kingdom; UK

DESCRIPTORS: Studies; Futures trading; Regression analysis; Mathematical models; Arbitrage; Volatility
CLASSIFICATION CODES: 9175 (CN=Western Europe); 3400 (CN=Investment analysis & personal finance); 9130 (CN=Experimental/Theoretical)
PRINT MEDIA ID: 9060

ABSTRACT: The objective of this paper is to uncover the determinants of trading intensity in futures markets. In particular, the time between adjacent transactions (referred to as transaction duration) on the FTSE 100 index futures market is modeled using various augmentations of the basic autoregressive conditional duration (ACD) model introduced by Engle and Russell {Econometrica 66 (1998) 1127). The definition of transaction duration used in this paper is an important variable as it represents the inverse of instantaneous conditional return volatility. As such, this paper can also be viewed as an investigation into the determinants of the (inverse of) instantaneous conditional return volatility. the estimated parameters from various ACD models form the basis of the hypothesis tests carried out in the paper. As predicted by various market microstructure theories, we find that **bid** -ask spread and transaction volume have a significant impact upon subsequent trading intensity. However, the major innovation of this paper is the finding that large (small) differences between the **market price** and the theoretical price of the futures contract (referred to as pricing error) lead to high (low) levels of trading intensity in the subsequent period. Moreover, the functional dependence between pricing error and transaction duration appears to be non-linear in nature. Such dependence is implied by the presence of arbitragers facing non-zero transaction costs. Finally, a comparison of the forecasting ability of the various estimated models shows that a **threshold** ACD model provides the best out-of- **sample** performance. (PUBLICATION ABSTRACT)

?

File 15:ABI/Inform(R) 1971-2005/May 14
(c) 2005 ProQuest Info&Learning

File 16:Gale Group PROMT(R) 1990-2005/May 13
(c) 2005 The Gale Group

File 148:Gale Group Trade & Industry DB 1976-2005/May 16

```
         (c)2005 The Gale Group
File 160:Gale Group PROMT(R) 1972-1989
         (c) 1999 The Gale Group
File 275:Gale Group Computer DB(TM) 1983-2005/May 16
         (c) 2005 The Gale Group
File 621:Gale Group New Prod.Annou.(R) 1985-2005/May 16
         (c) 2005 The Gale Group
File 626:Bond Buyer Full Text 1981-2005/May 16
         (c) 2005 Bond Buyer
File 608:KR/T Bus.News. 1992-2005/May 16
         (c)2005 Knight Ridder/Tribune Bus News
File   9:Business & Industry(R) Jul/1994-2005/May 13
         (c) 2005  The Gale Group
File  20:Dialog Global Reporter 1997-2005/May 16
         (c) 2005 The Dialog Corp.
File 623:Business Week 1985-2005/May 12
         (c) 2005 The McGraw-Hill Companies Inc
File 624:McGraw-Hill Publications 1985-2005/May 12
         (c) 2005 McGraw-Hill Co. Inc
File 636:Gale Group Newsletter DB(TM) 1987-2005/May 16
         (c) 2005 The Gale Group
File 813:PR Newswire 1987-1999/Apr 30
         (c) 1999 PR Newswire Association Inc
File 810:Business Wire 1986-1999/Feb 28
         (c) 1999 Business Wire
File 610:Business Wire 1999-2005/May 16
         (c) 2005 Business Wire.
File 476:Financial Times Fulltext 1982-2005/May 16
         (c) 2005 Financial Times Ltd
File 613:PR Newswire 1999-2005/May 16
         (c) 2005 PR Newswire Association Inc
File 634:San Jose Mercury  Jun 1985-2005/May 14
         (c) 2005 San Jose Mercury News
File 625:American Banker Publications 1981-2005/May 16
         (c) 2005 American Banker

Set     Items   Description
S1    5935027   BID? OR BIDDING OR AUCTION OR AUCTIONING OR MATCHING OR MA-
             TCH
S2    1503525   SAMPLE OR SAMPLING
S3       5966   RANDOM (N) NUMBER
S4          0   MAKERT (N) (PRICE OR VALUE OR COST)
S5     148332   BASELINE
S6     244142   THRESHOLD
S7    1735193   RESERVE
S8     608573   MARKET () (PRICE OR VALUE OR COST)
S9          0   S1(S)S2(S)S3(S)S8(S)S6
S10        13   S1(S)S2(S)S3
S11        10   RD (unique items)
S12         1   S1(S)S2(S)S8(S)S6
?
         5935027  S1
         1503525  S2
          148332  S5
          244142  S6
     S13        1  S1(S)S2(S)S5(S)S6
?
```

13/9/1   (Item 1 from file: 148)

DIALOG(R)File 148:Gale Group Trade & Industry DB

11483095   SUPPLIER NUMBER: 57472145   (THIS IS THE FULL TEXT)

A signal extraction approach to modeling hormone time series with pulses and a changing baseline.

Guo, Wensheng; Wang, Yuedong; Brown, Morton B.

Journal of the American Statistical Association, 94, 447, 746(1)
Sept, 1999
ISSN: 0162-1459 LANGUAGE: English RECORD TYPE: Fulltext; Abstract
WORD COUNT: 7760 LINE COUNT: 00648

AUTHOR ABSTRACT: Hormones serve as regulating signals for many biological processes. In recent years, it was determined that many hormones are secreted in a pulsatile manner and that the pulsatile secretion pattern, in addition to the absolute concentration level, is important in regulating biological processes. Consequently, it is necessary to characterize the latent secretion patterns from measurements of concentration levels. The characterization is complicated by the presence of a biological circadian rhythm. When hormone concentrations are plotted over time, the resultant time series usually exhibits occasional short rises superimposed on a slowly changing baseline. This is a result of a mixture of pulsatile secretions and a circadian rhythm. In this article we present a signal extraction approach to model simultaneously a slowly changing component and a pulsatile component of a time series. A smoothing spline is used to model the baseline, and a multiprocess dynamic linear model is used to model the pulsatile component. An additive structure is assumed, and both components are estimated simultaneously using a multiprocess Kalman filter. The unknown parameters are estimated by approximate maximum likelihood. The locations and amplitudes of the pulses are also estimated as posterior means via the multiprocess Kalman filter. Bayesian confidence intervals can be constructed for the baseline. This approach is found to be robust in simulated data and effective in modeling hormone time series.

KEY WORDS: Bayesian inference; Hormone model; Multiprocess dynamic linear model; Pulsatile time series; Smoothing spline; State-space model.

TEXT:

1. INTRODUCTION

This article considers the problem of modeling a time series consisting of pulses superimposed on a slowly changing component (baseline), which occurs in applications such as time series of hormone concentration levels in blood, voltages in neurons, and underground water levels. In hormone studies, the pulses may result from bursts of hormone secretion from a gland into the circulation system, whereas the baseline may represent a circadian rhythm in hormone concentration levels. For underground water levels, the pulses may result from precipitation, and the baseline may represent a smooth seasonal trend. In these applications the baseline may not be well described by a parametric function. When the pulse locations are known, the time series can be modeled by a partial spline model (Wahba 1990, chap. 6). When both components are smooth and their variances are stationary, Kitagawa and Gersch's (1984) smoothness prior approach can be used. However, no statistical methods are available for when the pulsatile component is irregular, changes abruptly, and has an unknown number of pulses and unspecified pulse locations. The difficulty is that the slowly changing component and the abruptly changing component are closely related and require simultaneous estimation.

The motivation for this article comes from our interest in modeling hormone time series. Hormones play important roles in regulating biological processes, such as reproduction, metabolism, and growth. Many hormones, including gonadotropin-releasing hormone (GnRH), luteinizing hormone (LH), follicle-stimulating hormone (FSH), growth hormone (GH), adrenocortocotropic hormone (ACTH), and cortisol, are secreted in a pulsatile manner. In recent years, increasing evidence (Clarke, Cummins, Findlay, Burman, and Doughton 1984; Shupnik 1990; Weiss, Jameson, Bumin, and Crowley 1990; Wilson et al. 1984) suggests that the secretion patterns and the absolute concentration level are important factors in triggering the response of a target tissue. Therefore, it is necessary to characterize the latent secretion patterns instead of the mean level, which is the main focus in most current statistical models. Although our eventual goal is to study effects of various factors on pulsatile patterns by comparisons across different groups, we use a two-stage approach because of the complexity of the problem. Our initial task is to characterize the underlying secretion by modeling the observed time series of hormone levels

of a single subject. A second-stage analysis can then be performed using the estimated parameters from the first stage as the new endpoints. Theoretically, it is possible to combine the two stages using a mixed-effects model. However, the resulting model is usually too complicated to produce stable estimates. Because the second-stage analysis uses standard statistical methods such as regression or mixed-effects models after appropriate transformations of the new endpoints, in this article we focus on the first-stage analysis that characterizes the secretion patterns for each time series.

In a typical endocrinological experiment, blood samples are collected sequentially from each subject and assayed for hormone concentrations. The resultant time series usually exhibits pulses superimposed on a slowly changing baseline, possibly due to a circadian rhythm. Figure 1(a) (solid line with dots) shows a time series of cortisol concentration in plasma from a control subject in an ongoing stress study conducted at the medical center of the University of Michigan. Blood samples were taken every 10 minutes and assayed for cortisol concentrations for a 24-hour interval, consisting of 144 time points. Cortisol, asteroid hormone secreted by the adrenal cortex, plays an important role in regulating metabolism. Stress is believed to be an important activator of cortisol secretion. A circadian oscillator, such as the wake/sleep cycle, also has a major impact on its secretion. The pattern of secretion may be abnormal in stressed patients, and the goal of the current study is to identify whether there is an excessive number of pulses, smaller pulse amplitudes, or disruption of the circadian rhythm in stressed patients compared to normal controls. The first step of the analysis is to characterize the latent secretion patterns in terms of summary statistics, which serve as new endpoints in a second-stage analysis to compare groups.

In recent years there have been several statistical models proposed for pulsatile time series without a baseline or with a constant baseline. A review was given by Mauger, Brown, and Kushler (1995). Among the model-based methods, Kushler and Brown (1991) and O'Sullivan and O'Sullivan (1988) chose pulse locations in a stepwise fashion. Diggle and Zeger (1989) and Komaki (1993), on the other hand, defined the probability of a pulse as a function of the concentration of the previous point and used maximum likelihood to estimate the model parameters. Because of their schemes to determine the pulse locations, these models break down when there is a changing baseline, which occurs often in hormone studies.

In this article we use structural modeling to decompose the observed time series into an abruptly changing component, a smoothly changing component, and measurement errors. The abruptly changing component can be further decomposed into discrete pulsatile inputs convoluted with an exponential decay. The decomposition of the 24-hour cortisol time series is shown in Figure 1, which is explained further in Section 4. The abruptly changing component is modeled by a multiprocess dynamic linear model; the smoothly changing component is modeled by a smoothing spline. The structural parameters all have specific interpretations and can be further modeled as functions of covariates. The two components are jointly modeled using a state-space representation and simultaneously estimated using a multiprocess Kalman filter.

The multiprocess dynamic linear model was first introduced by Harrison and Stevens (1971, 1976) for robust Bayesian forecasting. This model, along with their approximate estimation procedure (the multiprocess Kalman filter), has been widely used in various applications (e.g., Bolstad 1988; Gordon and Smith, 1990; Shumway and Stoffer 1991; Smith and West 1983; West and Harrison 1997, chap. 12). The basic idea of the multiprocess dynamic linear model is that there are a known number of underlying processes; at each time we observe only one of these processes through a certain observational mechanism. In the state-space framework, the components of the latent processes are represented by the state vector, and their transitions are characterized by a set of Markov transition equations; the observational equations define the observed signal as a linear combination of the state vector subject to measurement errors. In the applications to hormone time series with pulses, the two processes represent having and not having a pulse at time t.

In this article we adopt the multiprocess dynamic linear model

framework and use it as a random-effects model for the pulsatile component, where the pulse locations and magnitudes are modeled as random effects and estimated by their posterior means. Our main interest is to characterize the latent signals through the observed time series. The overall estimates of the structural parameters: mean pulse amplitude, pulse frequency, and decay rate are usually more interesting to researchers than the individual pulses. These unknown parameters are estimated by approximate maximum likelihood. We also modify the multiprocess Kalman filter algorithm by Bolstad (1988) and the classic fixed-interval smoothing algorithm by Rauch, Tung, and Striebel (1965) to obtain posterior estimates of both the pulsatile input and the state vector conditioned on the entire series.

A smoothing spline is a natural choice for the changing baseline because of its flexibility. Traditionally, it has been derived from penalized least squares where the smoothing parameter controls the trade-off between the variance and bias. Wahba (1978) showed that a smoothing spline can also be obtained through a signal extraction approach by introducing a stochastic smoothing spline model. Wecker and Ansley (1983) and Weinert, Byrd, and Sidu (1980) expressed this stochastic smoothing spline model in a state-space form. We combine the stochastic smoothing spline model with the multiprocess dynamic linear model into a unified state-space model. This leads to an efficient O(n) algorithm for jointly estimating the abruptly changing component and the slowly changing component. The smoothing parameter along with other unknown parameters can be estimated by maximizing the approximate joint likelihood, which can also be calculated efficiently using the multiprocess Kalman filter.

In recent years, simulation techniques (e.g. Carlin, Polson, and Stoffer 1992; Carter and Kohn 1994, 1996; De Jong and Shephard 1995; Shephard 1994) have been proposed to obtain exact Bayesian inference for this class of models. But these techniques are extremely computationally intensive, especially when many unknown parameters need to be estimated. The choice of prior must be considered on a case-by-case basis. It is also very difficult to check the convergence of these algorithms. Therefore, the proposed approximate maximum likelihood estimation using the Harrison-Stevens approximation is an efficient method for practical applications, which is supported by our simulations.

In Section 2 a general model is presented that decomposes a time series into a smooth trend and an abruptly changing signal. Its estimation is introduced in Section 3. In Section 4 a specific model for hormone time series is discussed and applied to real data. A simulation is used to assess the performance of the method in Section 5. In Section 6 we give a brief summary and discuss some generalizations.

2. THE MODEL

Without loss of generality, we assume that t (element of) (0, 1). Let y(t) be a time series sampled at t = (t.sub.1), (t.sub.2), . . ., (t.sub.n), where the times are not necessarily equally spaced. The observed series y(t) is partitioned into a slowly changing baseline, f(t), a pulsatile series, x(t), and a measurement error (Epsilon)(t):

y(t) = x(t) + f(t) + (Epsilon)(t), (1)

where x(t) is modeled as a multiprocess dynamic linear model, f(t) is modeled as a polynomial smoothing spline, and (Epsilon)(t) is modeled as Gaussian white noise, (Mathematical Expression Omitted). The models for x(t) and f(t) are discussed in the following sections.

2.1 The Multiprocess Model for x(t)

The multiprocess linear model for an unequally spaced setting, which includes data that are missing at random in an equally spaced setting as a special case, can be written as

x((t.sub.j)) = A((t.sub.j))x((t.sub.j-1)) + v((t.sub.j)), j = 1, . . ., n, (2)

where A((t.sub.j)) is determined by the system transfer function and v((t.sub.j)) is the input. The system transfer function is usually determined by setting up an approximate physical model and then solving the derived differential equations. In the applications to hormone data, the circulation system is usually modeled by compartmental models. The ability to estimate the parameters of these models is known to be limited when there are many compartments in the model, and a much faster sampling rate is required to estimate the extra parameters caused by the additional

compartment. The one-compartmental model or two-compartmental model is usually used to derive the transfer function. The one-compartmental model results in exponential decay (Kushler and Brown 1991), whereas a two-compartmental model leads to a mixture of two exponential decays (Hoffmann 1989). In equally spaced cases, exponential decay is reduced to a first-order autoregressive process, and the mixture of two exponential decays leads to a second-order autoregressive process (see Mauger 1995 for details).

The input v((t.sub.j)) is modeled by a multiprocess with both mean and variance indexed by the random variable I((t.sub.j)),

(Mathematical Expression Omitted),

where k is the number of potential states. The I((t.sub.j))'s are assumed to be independent and thus can be modeled as outcomes of a multinomial trial with prior probability ((Pi).sub.i)((t.sub.j)) = Pr(I((t.sub.j)) = i) for i = 0, . . ., k - 1. The parameters (Mathematical Expression Omitted) can be further modeled according to prior knowledge, such as functions of covariates including time.

2.2 The Smoothing Spline Model for f(t)

Wahba (1978) showed that a smoothing spline of degree 2m - 1 can be obtained through a signal extraction approach by introducing the following stochastic model for f(t):

(Mathematical Expression Omitted),

t (element of) (0, 1),

where W(h) is a Wiener process with unit dispersion parameter and (Lambda) is the smoothing parameter. The random vector (((Alpha).sub.0), . . ., ((Alpha).sub.m-1))(prime) is assigned a diffuse prior distribution N(0, (Zeta)I) with (Zeta) (similar to) (infinity).

Wecker and Ansley (1983) modified this stochastic model and showed that the polynomial smoothing spline can be written in a state-space form. As a result of the state-space representation, a smoothing spline can be calculated by efficient O(n) procedures: Kalman filter and fixed-interval smoother. Following their formulation, the system equation of f(t) can be written in terms of f((t.sub.j)) and its first m - 1 derivatives, F((t.sub.j) = (f((t.sub.j)), (f.sup.(1))((t.sub.j)), . . ., (f.sup.(m-1))((t.sub.j)))(prime):

F((t.sub.j)) = T((t.sub.j), (t.sub.j-1))F((t.sub.j-1)) + U((t.sub.j), (t.sub.j-1)),

j = 1, . . ., n, (3)

where T((t.sub.j), (t.sub.j-1)) is a m x m matrix with element (i, k) being (((t.sub.j) - (t.sub.j-1)).sup.k-i)/(k - i)) when i (greater than or equal to) k and 0 otherwise. The perturbation (U.sub.(t.sub.j), (t.sub.j-1)) is a m-dimensional vector with distribution (Mathematical Expression Omitted), where R((t.sub.j), (t.sub.j-1)) is a m x m matrix with element (i, k) being (((t.sub.j) - (t.sub.j-1)).sup.2m-i-k+1)/((m - i)!(m - k)!(2m - i - k - 1)!).

The most commonly used form of (3) is the cubic spline (m = 2). If we set U((t.sub.j), (t.sub.j-1)) to 0, then (3) represents a straight line. The perturbation component U((t.sub.j), (t.sub.j-1)) is modeled as a random effect and represents the smoothed deviation of the overall fitted curve from the straight line. Smoothness is controlled by the smoothing parameter (Lambda).

2.3 The Combined State-Space Model

Equations (1)-(3) can be combined into one unified state-space model,

y((t.sub.j)) = HZ((t.sub.j)) + (Epsilon)((t.sub.j)) (4)

and

Z((t.sub.j)) = (Phi)((t.sub.j))Z((t.sub.j-1)) + W((t.sub.j)), (5)

where H = (1, 1, 0, . . ., 0), Z((t.sub.j)) = (x((t.sub.j)), F(prime)((t.sub.j)))(prime), (Phi)((t.sub.j)) = diag(A((t.sub.j)), T((t.sub.j), (t.sub.j-1))), and W((t.sub.j)) = (v((t.sub.j)), U(prime) ((t.sub.j), (t.sub.j-1)))(prime).

Equation (4) is called the observational equation, which is a matrix representation of (1). It defines how we observe the latent components through an additive structure. Because the transition matrix (Phi)((t.sub.j)) is block diagonal, (5), the system-level equation, is a matrix representation of (2) and (3) simultaneously. The system-level equation is a Markov transition equation that defines the structures of the

latent components x(t) and f(t). The advantage of this unified state-space representation is that it allows us to adopt existing efficient estimation procedures, such as the multiprocess Kalman filter and fixed-interval smoother, to simultaneously estimate the latent components.

3. ESTIMATION

Similar to other random-effects models, estimation includes two steps. First, we obtain maximum likelihood estimates for the unknown parameters; then, based on these estimates, we calculate the posterior estimates of the latent signals x((t.sub.j)), f((t.sub.j)), and v((t.sub.j)), which are the decomposition of the observed time series. The hidden Markov structure of state-space models enables the likelihood and the posterior estimates of the latent signals conditioned on the history to be efficiently calculated in O(n) operation in a recursive fashion by the Kalman filter (KF). A backward O(n) recursive procedure, the fixed-interval smoothing algorithm, can then be applied to the results of the KF to produce posterior estimates of the state vector conditional on the whole series.

In Gaussian state-space models, each step of the recursive estimation can be carried out in a closed form by the KF. The expository article by Meinhold and Singpurwalla (1983) provides an intuitive introduction to the KF. The KF is a sequential forward-estimation procedure. At each step, it first uses the system-level equation to calculate P(Z((t.sub.j))(where)Y((t.sub.j-1))) from the previous result, where Y((t.sub.j)) = {y((t.sub.1)), . . ., y((t.sub.j))} denotes the entire history up to (t.sub.j). It then uses the observational equation to calculate P(y((t.sub.j)), Z((t.sub.j))(where)Y((t.sub.j-1))). The Z((t.sub.j)) can then be integrated out in a closed form to obtain P(y((t.sub.j))(where)Y((t.sub.j-1))), which is the contribution to the likelihood. By using some simple results from multivariate statistics, we then calculate P(Z((t.sub.j))(where)Y((t.sub.j))) from P(y((t.sub.j)), Z((t.sub.j))(where)Y((t.sub.j-1))), which prepares the KF for the next step. All these distributions are characterized by their first two moments.

In multiprocess dynamic linear models, estimation follows a similar procedure, but approximations or numerical methods are needed because the marginal distribution of Z((t.sub.j)) at each step is a mixture of normals. Harrison and Stevens (1971, 1976) proposed using a normal approximation to the mixture of normals, which results in a multiprocess Kalman filter (MKF). The MKF can be used to calculate an approximate likelihood and posterior estimates of the state. We extend the MKF by Harrison and Stevens (1976) to obtain the posterior estimate of the input, which is of particular interest in our applications.

Let (Theta) be the vector that includes all the unknown parameters. The likelihood can be obtained sequentially using the conditional densities p(y((t.sub.j))(where)Y((t.sub.j-1))),

L((Theta)(where)Y ((t.sub.n))) = p(y((t.sub.n))(where)Y((t.sub.n-1)), (Theta))p(y((t.sub.n-1))(where)Y((t.sub.n-2)), (Theta) . . . p(y((t.sub.1))(where)Y(0), (Theta)), (6)

where p(y((t.sub.j))(where)Y((t.sub.j-1)), (Theta)) is available at each step of the MKF. An optimization program can be used to obtain the maximum likelihood estimates for the parameters. Some transformations of the parameters to remove their constraints may also be needed, such as logarithm transformations for positive constraints and logit transformations for prior probabilities.

To fully specify the likelihood, the initial values of the state vector at time 0 need to be specified. Two approaches are available: to include the Z(0) as parameters and estimate them by maximum likelihood, and to put a diffuse prior on Z(0) that reflects our lack of knowledge of the initial conditions. We use the second approach, because it reduces the dimension of the optimization problem. In the Gaussian state-space model, two approaches were introduced by Ansley and Kohn (1985) and De Jong (1988, 1991) to incorporate diffuse priors on initial states. These approaches cannot be directly used in our model, because they require knowledge about the pulse locations. We adopt the numerical realization approach of Harvey and Phillips (1979), which assumes that the elements of Z(0) have zero means and large variances. A drawback of this approach is that very large initial variances may cause numerical problems. From our experience, once

the initial variances are greater than 100 times the scale of the y(t)'s, different choices of the initial variances have little impact on the estimates. Because it is always possible to rescale the observations when the scale of y(t) is truly large, the numerical values used for the initial variances are usually far from the boundary that causes numerical problems. We find that this numerical approach is an easy way to approximate the diffuse priors.

Our estimation procedure consists of a recursive forward algorithm, the MKF, and a recursive backward algorithm, the fixed-interval smoother (FIS). The MKF starts from the initial values Z(0) and sequentially calculates P(Z((t.sub.j))(where)Y((t.sub.j)), (Theta)) for j = 1, . . ., n. The FIS runs backward based on the results of the MKF to sequentially obtain the smoothed estimates P(Z((t.sub.j))(where)Y((t.sub.n)), (Theta)). Because each observation's contribution to the likelihood is available through the MKF, the approximate maximum likelihood estimation procedure involves only the MKF. The FIS needs to be run only once based on the final set of estimates.

In hormone time series, the input represents the hormone secretion from the gland and is the latent signal that we want to characterize. We propose to augment the input v(t) into the state vector Z(t) and estimate it together with the state vector using the MKF and FIS. Define (Mathematical Expression Omitted), (Mathematical Expression Omitted), and (Mathematical Expression Omitted). Let (Mathematical Expression Omitted) and (Mathematical Expression Omitted). The MKF and FIS are then applied on (Mathematical Expression Omitted) to obtain filtered estimates and smoothed estimates of both v((t.sub.j)) and Z((t.sub.j)). Technically, all of the conditional distributions should depend on (Theta), as do the means and variances. To simplify the notation, we omit (Theta) when it is obvious.

The MKF resembles that of Bolstad (1988) and Harrison and Stevens (1971, 1976), except that we augment the input v(t) into the state vector Z(t). This enables us to obtain the posterior estimates of the input v(t) along with those of the state vector Z(t). The algorithm is presented in Appendix A. Because of the approximation in step 5 of the algorithm, the resultant likelihood is only an approximation.

The MKF produces filtered estimates of the state variables (Mathematical Expression Omitted) conditioned on the history Y((t.sub.j)). For the purpose of estimation, we are more interested in the smoothed estimates conditioned on the entire series Y((t.sub.n)). The classic fixed-interval smoothing algorithm for the state vector, first introduced by Rauch et al. (1965), can be directly extended to obtain the smoothed estimates for (Mathematical Expression Omitted) (both the state vector and the input) based on the filtered estimates calculated previously. The algorithm is given in Appendix B. In the regular KF, the smoothed estimates are the best linear unbiased predictions (BLUP's) (Robinson 1991). In multiprocess models these are only approximate, because of the normal approximation to the mixture of normal distributions at each step.

4. APPLICATION TO HORMONE TIME SERIES DATA

We apply our model to hormone time series data collected from a stress study conducted at the medical center of the University of Michigan. The study was approved by the medical center's Institutional Review Board for Human Subject Research, and each subject provided written informed consent. Blood samples were taken every 10 minutes from each individual and assayed for cortisol concentrations for a 24-hour interval started at 9 am; therefore, each series consists of 144 time points. The data contained less than 1% missing values due to bad assays. These missing values are treated as unobserved, and the resultant time series is modeled as an unequally spaced time series in our analysis. The goal of the study is to identify abnormalities in secretion patterns in stressed women compared to those in normal women. The first step of the analysis is to characterize the latent secretion patterns in terms of summary statistics. A second-stage analysis can be performed using these summary statistics as the new endpoints. Because the methods used in the second-stage analysis are usually standard, in this section we focus on the first-stage analysis required for each time series.

Figure 1(a) shows the data from a control subject, which comprises a pulsatile series superimposed on a slowly changing baseline. The baseline

is due to a biological circadian rhythm, and the pulses are results of bursts of cortisol from the adrenal cortex. The circulation system is modeled by a compartmental system that approximates the whole system by a few well-mixed compartments. In two-compartmental models, the second compartment is usually much smaller than the main one. This leads to a mixture of two exponential decays with two very different half-lives, which usually differ by 10-20 times (e.g., Hoffmann 1989). If we do not sample fast enough, then we do not have sufficient information to estimate the second decay component. In our particular application to cortisol data, the longer half-life is around 30 minutes, whereas the shorter half-life may be around 2-3 minutes. To estimate the shorter half-life, a sampling rate of one sample per minute may be needed, which is not feasible due to the amount of blood that would be needed from each subject. Thus we model the circulation system as a one-compartment model. This leads to an exponential-decay-toward-baseline model for the pulsatile series (see Kushler and Brown 1991). Equation (2) is then written as

x((t.sub.j)) = (e.sup.-(Gamma)((t.sub.j) - (t.sub.j-1)) x ((t.sub.j-1)) + v((t.sub.j)), (7)

where (Gamma) is the decay rate and v((t.sub.j)) is the net input of the hormone into the blood system from (t.sub.j-1) to (t.sub.j). That is, A((t.sub.j)) = (e.sup.-(Gamma)((t.sub.j) - (t.sub.j-1))). By modeling the circulation system as one compartment, and because of the removal effect from the body, the expected concentration at (t.sub.j) is (e.sup.-(Gamma)((t.sub.j) - (t.sub.j-1))) x ((t.sub.j-1)) if there is no secretion during the interval ((t.sub.j), (t.sub.j-1)). The difference between x((t.sub.j)) and (e.sup.-(Gamma)((t.sub.j) - (t.sub.j-1))) x ((t.sub.j-1)) is the net input due to the secretion within (t.sub.j) - (t.sub.j-1). We model this net input v((t.sub.j)) by a multiprocess with two classes (k = 2) indexed by I((t.sub.j)), where I((t.sub.j)) = 1 indicates pulsatile secretion between time (t.sub.j-1) and (t.sub.j), and I((t.sub.j)) = 0 indicates no secretion. With ((Mu).sub.0) ((t.sub.j)) and (Mathematical Expression Omitted) set to 0, v ((t.sub.j)) is 0 with probability 1 when I((t.sub.j)) = 0. The structural parameters (Mathematical Expression Omitted) can be further modeled according to prior knowledge, such as functions of the history to allow a feedback mechanism. In the absence of prior knowledge, the net input v((t.sub.j)) is modeled as

(Mathematical Expression Omitted),

with the prior probability P(I((t.sub.j)) = 1) = (Pi). Theoretically, there can be multiple secretory events in the interval ((t.sub.j), (t.sub.j-1)), and the prior probability P(I((t.sub.j)) = 1) should also be a function of the length of this interval. However, if our sampling rate is much slower than the secretion rate, we do not have information to characterize an individual secretory event. The only information that we have is the net amount of secretion (total secretion minus decay) at the end of that interval, which is modeled by v((t.sub.j)). Instead of defining a pulse as an underlying secretory event, we define a "pulse" as the net amount of secretion within the sampling interval. That is, each interval can only have one "pulse," and a longer interval may lead to a larger "pulse" that may be the sum of multiple secretory events. We model the mean pulsatile input per unit time and its standard deviation as (Mu) and ((Sigma).sub.p). Assuming independence between two secretory events, the mean and variance of the net input in an interval is proportional to the length of the interval. The estimate of (Pi) has an interpretation as the average probability of a pulse occurring in each sampling interval. This is a measure of pulse frequency in equally spaced settings.

A cubic spline (m = 2) is usually adequate for modeling f(t). When prior information on f(t) is available, such as a circadian rhythm, the approach of Kohn, Ansley, and Wong (1993) can be used. Equation (3) is simplified as follows for a cubic spline:

(Mathematical Expression Omitted), (8)

where

(Mathematical Expression Omitted).

The model specified by (7) and (8) was used to analyze the cortisol hormone data. For the purpose of illustration, we present the results of the analysis of the cortisol data from one of the control subjects. Figure 1 presents the original data along with the estimates of baseline, pulse

locations, and magnitudes. The estimate of the baseline matches our intuition and the variation in the baseline is significant, because the 95% confidence interval does not include a horizontal line. The posterior probability of a pulse and the input are estimated at each time point. If a definitive classification is desired, an investigator can apply a threshold to the posterior probabilities according to the desired sensitivity and specificity. Another method of classification is to construct confidence intervals for the inputs and check whether they include 0.

Because we use approximate maximum likelihood estimates, the standard errors of these estimates cannot be obtained directly from the naive Fisher information matrix, which treats the approximate likelihood as the true likelihood. We use a parametric bootstrap approach that regenerates pulses and measurement errors based on the parameter estimates. We generated 1,000 bootstrap samples and estimated the standard errors of the parameter estimates by bootstrap standard deviations. Because the MKF is a very efficient algorithm, this bootstrap procedure takes only about 1 hour on a Sun ULTRA-SPARC1. The parameter estimates for the time series shown in Figure 1 are (Mathematical Expression Omitted), (Mathematical Expression Omitted), (Mathematical Expression Omitted), (Mathematical Expression Omitted), and (Mathematical Expression Omitted), where the numbers in the parentheses are the estimates of standard errors by the parametric bootstrap and those in the brackets are estimates of standard errors obtained through the naive Fisher information matrix by treating the approximate likelihood as the true likelihood. Except for (Mathematical Expression Omitted) and (Mathematical Expression Omitted), the estimates of the standard errors are similar for the two procedures. For (Mathematical Expression Omitted) and (Mathematical Expression Omitted), the estimates of the standard errors by the naive procedure are about one-half those by the bootstrap; this may be due to the normal approximation to the mixture of normals.

5. SIMULATION

To assess the performance of our method, a set of simulations was carried out for the hormone model specified by (7) and (8). Because the exponential-decay-toward-baseline model was used in many pulse-detection models and has proven to be a reasonable approximation of the circulation system, we generated our pulse sequence x(t) using (7). The baseline was specified by a sine curve with a constant level shift to ensure that it was positive: f(t) = 20 + A sin(2 x 3.1415926 x (t - 1)/144), for t = 1, . . ., 144, where A is the amplitude of the baseline. The settings are specified by parameters {(Mu), (Pi), (Alpha) = (e.sup.-(Gamma)), ((Sigma).sub.e), ((Sigma).sub.p), A}. Because estimation is invariant to rescaling, we fixed (Mu) = 10 and varied the other parameters. A factorial design with the following settings was used: (Pi) was 10% or 20%; (Alpha) was .5, .7 or .84, corresponding to half-lives equal to 1, 2, and 4 time points; A was 2.5 or 7.5, which makes the fluctuation of the baseline 50% x (Mu) or 150% x (Mu); ((Sigma).sub.p) was chosen as 1, 2 or 3; and ((Sigma).sub.e) was 1 or 2. From our experience, these settings cover many real cases that arise from endocrinological studies.

For each setting, we generated 100 equally spaced time series, each with length of 144 time points, which is the same as a time series sampled every 10 minutes for a 24-hour interval. Figure 2 presents a typical simulated series along with its fitted results. The settings of the parameters are {(Mu) = 10, (Alpha) = .7, (Pi) = .1, ((Sigma).sub.p) = 2, ((Sigma).sub.e) = 1, A = 15}. The estimates of the baseline, pulse locations, and magnitudes are very close to their true values.

Boxplots of the maximum likelihood estimates are used to examine the performance of the estimation procedure at each setting. False-positive and false-negative rates for pulse identifications were calculated by applying a .5 **threshold** to the posterior probabilities. In the range of our simulations, different settings of the half-lives and the fluctuations of the **baseline** did not have much influence on the parameter estimation. The choice of (Pi) has an effect of the estimation of (Mu) and ((Sigma).sub.p), but the patterns are very similar. We thus present results only when (Alpha) = .7 and (Pi) = .1; we pooled the results across the two settings of A. The variance of the measurement error (Mathematical Expression Omitted) was estimated well in all settings; however, it is usually of

little interest. Figure 3 shows the estimates of (Pi), (Mu), (Alpha), ((Sigma).sub.p), and false-positive and false-negative rates, where each boxplot represents the results from 2 x 100 simulations. The variability of these estimates comes both from variation in generating the data and from potential bias in estimation. The interquartile intervals for ((Sigma).sub.p) and (Mu) are relatively wide, because their effective **sample** sizes are the number of pulses, which is small. As (Pi) increases (not shown in (ILLUSTRATION FOR FIGURE 3 OMITTED)), the expected number of pulses increases, and the interquartile intervals for (Mu) and ((Sigma).sub.) narrow. The effect of (Pi) on estimation of (Alpha) is small, because it uses all of the points on the decay sides of the pulses. In the simulation, the most important factors are ((Sigma).sub.e) and ((Sigma).sub.p), which reflect the measurement error and the homogeneity of pulses. When ((Sigma).sub.e) = 1 (i.e., ((Sigma).sub.e)/(Mu) is small), the interquartile intervals are very narrow, and the false-positive and false-negative rates are essentially 0. As ((Sigma).sub.e) and ((Sigma).sub.p) increase, the interquartile intervals become wider, and the false-positive rate and false-negative rate increase. These results **match** our intuition that large measurement error and heterogeneity of pulses can cause misidentification of pulses.

To investigate whether the one-compartmental model is applicable, we conducted another simulation that generated the data using a two-compartmental model and reestimated it with a one-compartmental model. We set the longer half-life as 20 minutes with a 10-minute sampling rate. We varied the ratios of the shorter half-life to the longer one by 1/5 and 1/10. In the first setting, the simulation showed very small bias in (Alpha), (Pi), (Mu), and ((Sigma).sub.e). The bias vanished in the second setting. This result is intuitive, because the impact of the faster decay after 5 or 10 half-lives is negligible. Thus the exponential-decay-toward-baseline model is adequate for practical application.

6. DISCUSSION

We have presented a signal extraction approach to model a time series that comprises a smoothly changing baseline and pulses, which cannot be modeled by existing methods. Existing methods require that the baseline be constant or that the locations of the pulses be known. In our model a smoothing spline is used to model the low-frequency component, and a multiprocess dynamic linear model is used to detect the abruptly changing signals. By using a state-space representation, the baseline and pulses are jointly modeled as stochastic components and simultaneously estimated by their posterior predictions conditioned on the whole series. An approximate likelihood method is used to estimate the parameters, such as pulse rate and mean pulse amplitude, which are often the primary interests of researchers. This approximate method produces very good estimates in the range of our simulations. The state-space representation also results in a very efficient O(n) algorithm for the likelihood calculation.

We used an example of hormone time series with pulses to demonstrate this model, where the pulses are modeled as jumps followed by exponential decays. The pulses can be viewed broadly as any abrupt structural changes, such as jumps, spikes, and even changepoints. Equation (2) can have a vector form to allow a more complicated structure. Prior information, such as a feedback mechanism and covariates, can also be incorporated by modeling the structural parameters {((Pi).sub.i)((t.sub.j)), ((Mu).sub.i)((t.sub.j)), (Mathematical Expression Omitted)}.

The inputs v((t.sub.j))'s in (2) are assumed to be independent of each other in the current model. Our method assumes that a surge with two points in the rising slope is a result of two consecutive independent inputs. This assumption is valid for time series with a slow sampling rate relative to the duration of the secretory event. However, in time series that are sampled rapidly, an input may continue over several time points. The dependency between the v((t.sub.j))'s needs to be modeled explicitly and will be explored in future research.

Here we have focused on a times series model. In many endocrinological studies, the eventual goal is to study the effects of various factors on secretion by comparison across series. Because of the complexity of the problem, we currently approach the problem by a two-stage

approach. We first characterize the secretion pattern of each time series in terms of half-life, pulse frequency, and mean pulse amplitude, and then use these estimated parameters as new endpoints in the second-stage analysis. The analysis used in the second stage depends on the study design. It may be desirable to combine the two stages using a mixed-effects type of model. In the absence of pulses, several authors (Brumback and Rice 1998; Wang 1998) have generalized smoothing splines to a mixed-effects type of model that can model functional data from different subjects. When there are pulses superimposed on a smooth curve, the extension to multiple subjects can be complicated due to the complex model structure. We will explore this possibility in our future research.

APPENDIX A: THE MULTIPROCESS KALMAN FILTER

For any given values of (Theta), a step of the algorithm MKF starts at (t.sub.j-1) with (Mathematical Expression Omitted) and (Mathematical Expression Omitted).

1. Conditioned on {Y((t.sub.j-1)), I((t.sub.j)) = i}, the distribution of (Mathematical Expression Omitted) is characterized by its first two moments:

(Mathematical Expression Omitted)

and

(Mathematical Expression Omitted).

2. The predicted distribution of y((t.sub.j)) given Y((t.sub.j-1)) conditioned on I((t.sub.j)) is also characterized by its first two moments:

(Mathematical Expression Omitted)

and

(Mathematical Expression Omitted).

The marginal distribution of (y((t.sub.j))(where)Y((t.sub.j-1))) is a mixture of k normal distributions:

(Mathematical Expression Omitted).

The density p(y((t.sub.j))(where)Y((t.sub.j-1))) calculated from the foregoing distribution is the contribution to the likelihood in (6).

3. The posterior probability of the index variable I((t.sub.j)) = i given Y((t.sub.j)) is then

(Mathematical Expression Omitted), (A.1)

which can be obtained from the conditional distributions given previously.

4. Given Y((t.sub.j)), we can update the first two moments of (Mathematical Expression Omitted) conditioned on I((t.sub.j)) as

(Mathematical Expression Omitted)

and

(Mathematical Expression Omitted).

5. The marginal distribution of (Mathematical Expression Omitted) is a mixture of k normal distributions. We adopt the Harrison and Stevens (1976) approach and approximate the marginal distribution by a normal distribution with the same first two moments, which minimizes the Kullback-Leibler distance (West and Harrison, 1997, chap. 12):

(Mathematical Expression Omitted)

and

(Mathematical Expression Omitted).

The algorithm is ready for the next step starting at (t.sub.j).

APPENDIX B: THE FIXED INTERVAL SMOOTHER

The algorithm FIS starts with (Mathematical Expression Omitted) and (Mathematical Expression Omitted) from the last step of the MKF. For j = n-1, . . ., 1, (Mathematical Expression Omitted) and (Mathematical Expression Omitted) are calculated recursively as

(Mathematical Expression Omitted)

and

(Mathematical Expression Omitted),

where

(Mathematical Expression Omitted),

and

(Mathematical Expression Omitted).

The Bayesian confidence intervals (Wahba 1983) for f(t) and its first m - 1 derivatives can be constructed based on the covariance matrices (Sigma)((t.sub.j)(where)(t.sub.tn)).

REFERENCES

Ansley, C. F., and Kohn, R. (1985), "Estimation, Filtering and Smoothing in State-Space Models With Incompletely Specified Initial Conditions," The Annals of Statistics, 13, 1286-1316.

Bolstad, W. (1988), "The Multiprocess Dynamic Linear Model With Biased Perturbations: A Real Time Model for Growth Hormone Level," Biometrika, 75, 685-692.

Brumback, B. A., and Rice, J. A. (1998), "Smoothing Spline Models for the Analysis of Nested and Crossed Samples of Curves," Journal of American Statistical Association, 93, 961-976.

Carlin, B. P., Polson, N. G., and Stoffer, D. (1992), "A Monte Carlo Approach to Non-Normal and Nonlinear State-Space Modeling," Journal of the American Statistical Association, 87, 493-500.

Carter, C. K., and Kohn, R. (1994), "On Gibbs Sampling for State-Space Models," Biometrika, 81, 541-553.

----- (1996), "Markov Chain Monte Carlo in Conditionally Gaussian State-Space Models," Biometrika, 83, 589-601.

Clarke, I. J., Cummins, J. T., Findlay, J. K., Burman, K. J., and Doughton, B. W. (1984), "Effects on Plasma Luteinizing Hormone and Follicle-Stimulating Hormone of Varying Frequency and Amplitude of Gonadotropin-Releasing Hormone Pulses in Ovariectomized Ewes With Hypothalamo-Pituitary Disconnection," Neuroendocrinology, 39(3), 214-221.

De Jong, P. (1988), "The Likelihood for State-Space Models," Biometrika, 75, 165-169.

----- (1991), "The Diffuse Kalman Filter" The Annals of Statistics, 12, 143-157.

De Jong, P., and Shephard, N. (1995), "Simulation Smoother for Time Series Models," Biometrika, 82, 339-350.

Diggle, P., and Zeger, S. (1989), "A Non-Gaussian Model for Time Series With Pulses," Journal of the American Statistical Association, 84, 354-359.

Gordon, A. E., and Smith, A. F. M. (1990), "Monitoring and Modeling Biomedical Time Series," Journal of the American Statistical Association, 85, 328-337.

Harrison, P. J., and Stevens, C. E (1971), "A Bayesian Approach to Short-Term Forecasting," Operational Research Quarterly, 22, 341-362.

----- (1976), "Bayesian Forecasting" (with discussion), Journal of the Royal Statistical Society, Ser. B, 38, 205-247.

Harvey, A. C., and Phillips, G. D. A. (1979), "Maximum Likelihood Estimation of Regression Models With Autoregressive Moving Average Disturbances," Biometrika, 66, 49-58.

Hoffmann, R. G. (1989), "Concordance and Irregularity Estimation for Episodic Hormone Data," in Proceedings of the Statistical Computing Section, American Statistical Association, pp. 301-305.

Kitagawa, G., and Gersch, W. (1984), "A Smoothness Priors State-Space Modeling of Time Series With Trend and Seasonality" Journal of American Statistical Association, 79, 378-389.

Kohn, R., Ansley, C. F., and Wong, D. (1993), "Nonparametric Spline Regression With Prior Information," Biometrika, 80, 75-88.

Komaki, E (1993), "State-Space Modeling of Time Series Sampled From Continuous Processes With Pulses," Biometrika, 80, 417-29.

Kushler, R. H., and Brown, M. B. (1991), "A Model for the Identification of Hormone Pulses," Statistics in Medicine, 10, 329-40.

Mauger, D. (1995), "A New Method for Charactering Hormone Pulses in a Time Series," Ph.D. dissertation, University of Michigan, Dept. of Biostatistics.

Mauger, D., Brown, M. B., and Kushler, R. H. (1995), "A Comparison of Methods That Characterize Pulse in a Time Series," Statistics in Medicine, 14, 311-325.

Meihold, R. J., and Singpurwalla, N. D. (1983), "Understanding the Kalman Filter" The American Statistician, 37, 123-127.

O'Sullivan, F., and O'Sullivan, J. (1988), "Deconvolution of Episodic Hormone Data: An Analysis of the Role of Season on the Onset of Puberty in Cows" Biometrics, 44, 339-353.

Rauch, H. E., Tung, F., and Striebel, C. T. (1965), "Maximum Likelihood Estimates of Linear Dynamic Systems," AIAA Journal, 3, 1445-1450.

Robinson, G. K. (1991), "That BLUP is a Good Thing: The Estimation of Random Effects" (with discussion), Statistical Science, 6, 15-51.

Shephard, N. (1994), "Partially Non-Gaussian State-Space Models," Biometrika, 81, 115-131.

Shumway, R. H., and Stoffer, D. S. (1991), "Dynamic Linear Models With Switching" Journal of American Statistical Association, 86, 763-769.

Shupnik, M. A. (1990), "Effects of Gonadotropin-Releasing Hormone on Rat Gonadotropin Gene Transcription in Vitro: Requirement for Pulsatile Administration for Luteinizing Hormone-Beta Gene Stimulation," Molecular Endocrinology, 4(10), 1444-1450.

Smith, A. F. M., and West, M. (1983), "Monitoring Renal Transplants: An Application of the Multiprocess Kalman Filter" Biometrics, 39, 867-878.

Wahba, G. (1978), "Improper Priors, Spline Smoothing and the Problem of Guarding Against Model Errors in Regression," Journal of the Royal Statistical Society, Ser. B, 40, 364-372.

----- (1983), "Bayesian Confidence Intervals for the Cross-Validated Smoothing Spline," Journal of the Royal Statistical Society, Ser. B, 45, 133-150.

----- (1990), Spline Models for Observational Data, CBMS-NSF Regional Conference Series in Applied Mathematics, Vol. 59, Philadelphia: Society of Industrial and Applied Mathematics.

Wang, Y. (1998), "Mixed-Effects Smoothing Spline ANOVA," Journal of the Royal Statistical Society, Ser. B, 60, 159-174.

Wecker, W. E., and Ansley, C. F. (1983), "The Signal Extraction Approach to Nonlinear Regression and Spline Smoothing," Journal of the American Statistical Association, 78, 81-89.

Weinert, H. L., Byrd, R. H., and Sidhu, G. S. (1980), "A Stochastic Framework for Recursive Computation of the Spline Functions: Part II. Smoothing Spline," Journal of Optimization Theory and Application, 30, 255-268.

Weiss, J., Jameson, J. L., Burrin, J. M., and Crowley, W. F. (1990), "Divergent Responses of Gonadotropin Subunit Messenger RNA's to Continuous Versus Pulsatile Gonadotropin-Releasing Hormone in Vitro," Molecular Endocrinology, 4(4), 557-564.

West, M., and Harrison, J. (1997), Bayesian Forecasting and Dynamic Models, New York: Springer-Verlag.

Wilson, R. C., Kesner, J. S., Kaufman, J. M., Uemura, T., Akema, T., and Knobil, E. (1984), "Central Electro-Physiologic Correlates of Pulsatile Luteinizing Hormone Secretion in Rhesus Monkey," Neuroendocrinology, 39(3), 256-260.

Wensheng Guo is Assistant Professor, Department of Biostatistics and Epidemiology, University of Pennsylvania School of Medicine, Philadelphia, PA 19104. Yuedong Wang is Assistant Professor, Department of Statistics and Applied Probability, University of California, Santa Barbara, CA 93106. Morton B. Brown is Professor, Department of Biostatistics, University of Michigan, Ann Arbor, MI 48109. This research was supported by grants P60 DK20572, P30 HD18258, R01 EY09946 and R01 GM58533. The authors thank Leslie Crofford for allowing use of the cortisol data and the editor, the associate editor and the referees for their comments, which substantially improved this article.

INDUSTRY CODES/NAMES: BUS Business, General; BUSN Any type of business

DESCRIPTORS: Hormones--Models; Time-series analysis--Models

FILE SEGMENT: TI File 148

?

```
         (c) 2005 The Gale Group
File 621:Gale Group New Prod.Annou.(R) 1985-2005/May 16
         (c) 2005 The Gale Group
File 626:Bond Buyer Full Text 1981-2005/May 16
         (c) 2005 Bond Buyer
File 608:KR/T Bus.News. 1992-2005/May 16
         (c)2005 Knight Ridder/Tribune Bus News
File   9:Business & Industry(R) Jul/1994-2005/May 13
         (c) 2005  The Gale Group
File  20:Dialog Global Reporter 1997-2005/May 16
         (c) 2005 The Dialog Corp.
File 623:Business Week 1985-2005/May 12
         (c) 2005 The McGraw-Hill Companies Inc
File 624:McGraw-Hill Publications 1985-2005/May 12
         (c) 2005 McGraw-Hill Co. Inc
File 636:Gale Group Newsletter DB(TM) 1987-2005/May 16
         (c) 2005 The Gale Group
File 813:PR Newswire 1987-1999/Apr 30
         (c) 1999 PR Newswire Association Inc
File 810:Business Wire 1986-1999/Feb 28
         (c) 1999 Business Wire
File 610:Business Wire 1999-2005/May 16
         (c) 2005 Business Wire.
File 476:Financial Times Fulltext 1982-2005/May 16
         (c) 2005 Financial Times Ltd
File 613:PR Newswire 1999-2005/May 16
         (c) 2005 PR Newswire Association Inc
File 634:San Jose Mercury  Jun 1985-2005/May 14
         (c) 2005 San Jose Mercury News
File 625:American Banker Publications 1981-2005/May 16
         (c) 2005 American Banker

Set     Items   Description
S1    5935027   BID? OR BIDDING OR AUCTION OR AUCTIONING OR MATCHING OR MA-
             TCH
S2    1503525   SAMPLE OR SAMPLING
S3       5966   RANDOM (N) NUMBER
S4          0   MAKERT (N) (PRICE OR VALUE OR COST)
S5     148332   BASELINE
S6     244142   THRESHOLD
S7    1735193   RESERVE
S8     608573   MARKET () (PRICE OR VALUE OR COST)
S9          0   S1(S)S2(S)S3(S)S8(S)S6
S10        13   S1(S)S2(S)S3
S11        10   RD (unique items)
S12         1   S1(S)S2(S)S8(S)S6
S13         1   S1(S)S2(S)S5(S)S6
?
>>>Possible typing error near end of command
?
         5935027  S1
         1503525  S2
          244142  S6
         1735193  S7
     S14       2  S1(S)S2(S)S6(S)S7
?
```

14/K/1   (Item 1 from file: 20)
DIALOG(R)File 20:(c) 2005 The Dialog Corp. All rts. reserv.

42272673
Q1 2005 EnCana Corporation Earnings Conference Call - Part 1
April 27, 2005
WORD COUNT: 4593

COMPANY NAMES: EnCana Corp; Goldman Sachs Group Inc; Premcor Inc

DESCRIPTORS: Company News; Dividends; Energy Markets; Facilities & Equipment; Forecasts & Predictions; General News; Human Resources & Employment; Interim Results; Market News; Marketing; Markets; Meetings; Metals Markets; Natural Resources; New Issues; Production; Public Offerings; Results; Rights Issues; Sales; Share Buy-backs; Share Option Schemes; Share Structure; Shareholdings; Strategy
COUNTRY NAMES/CODES: Canada (CA) ; Ecuador (EC) ; Peru (PE) ; United Kingdom (GB) ; United States of America (US)
REGIONS: Americas; Europe; Latin America; North America; South America ; Western Europe
PROVINCE/STATE: Alberta; British_Columbia; Ohio; Wyoming
SIC CODES/DESCRIPTIONS: 2911 (Petroleum Refining); 1311 (Crude Petroleum & Natural Gas); 1321 (Natural Gas Liquids); 4924 (Natural Gas Distribution) ; 5735 (Record & Prerecorded Tape Stores); 6231 (Security & Commodity Exchanges); 1381 (Drilling Oil & Gas Wells); 9512 (Land Mineral Wildlife Conservation); 4920 (Gas Production & Distribution); 5940 (Miscellaneous Shopping Goods Stores); 6211 (Security Brokers & Dealers); 1080 (Metal Mining Services); 9510 (Environmental Quality); 4600 (Pipelines Ex Natural Gas); 6000 (Depository Institutions); 4200 (Trucking & Warehousing)
NAICS CODES/DESCRIPTIONS: 92412 (Admin of Conservation Programs); 9241 (Admin of Environmental Quality Programs); 4512 (Book Periodical & Music Stores); 211111 (Crude Petroleum & Natural Gas Extraction); 213111 (Drilling Oil & Gas Wells); 52 (Finance & Insurance); 21311 (Mining Support Activities); 22121 (Natural Gas Distribution); 211112 (Natural Gas Liquid Extraction); 21111 (Oil & Gas Extraction); 3241 (Petroleum & Coal Products Mfg); 32411 (Petroleum Refineries); 486 (Pipeline Transportation); 48621 (Pipeline Transportation of Natural Gas); 45122 (Prerecorded Tape CD & Record Stores); 44 (Retail Trade); 52321 (Securities & Commodity Exchanges); 523 (Security Commodity Contracts & Like Activity); 451 (Sporting Goods Hobby Book & Music Stores); 48 (Transportation & Warehousing)

... and its operating results according to U.S. protocols, which means that production volumes and **reserve** amounts are reported on an after royalties basis. Accordingly any references to dollars, reserves or...
... on disposition of our noncore assets in the Gulf of Mexico, Western Canada and Ecuador. **Bids** for the Gulf of Mexico assets were received last week and we expect to make...

...creation of a stand-alone energy trust. The Ecuador sale process is also active with **bids** due next month. We are focused on completing that sale sometime this year. Ecuador operations...

... you, Gwyn. Throughout the quarter we continued to purchase shares under our normal course issuer **bid** . We believe that this is the best ...result of the exercise of stock options. We still have room under our current issuer **bid** approval for up to 10% of the public float to purchase approximately 20 million more...

...target range by year-end, even after providing for the completion of our 10% issuer **bid** program. Cash taxes from continuing operations for the first quarter were 225 million, same as...

... depending on the forward strip on the last day of each quarter. As a further **sample** of volatility, on April 21st of this year WTI closed at $55.62 per barrel...per barrel WTI oil price and $5 per MCF NYMEX gas price with a minimum **threshold** of at least a 15% after-tax risk-weighted return, the same minimum return criteria...

14/K/2 (Item 2 from file: 20)

32353697

Drexler Technology at American Electronics Association Classic Financial Conference - Part 1

November 04, 2003

WORD COUNT: 4824

COMPANY NAMES: Accenture Ltd; Drexler Technology Corp; International Organisation for Standards; Lockheed Martin Corp; State Department US; United States Army

DESCRIPTORS: Awards; Company News; Contracts & New Orders; Demographics ; Economic News; General News; Global & International Economics; Government Budgets; Government News; Health & Healthcare; International Affairs; Marketing; New Products & Services; Politics; Product Management; Production; Research & Development; Social Welfare & Social Services; Summits & Talks

COUNTRY NAMES/CODES: Canada (CA) ; China (CN) ; France (FR) ; India (IN) ; Iraq (IQ) ; Italy (IT) ; Mexico (MX) ; Russia (RU) ; Senegal (SN) ; United States of America (US)

REGIONS: Africa; Americas; Arabian States; Asia; Central America; Europe; Former USSR; Gulf States; Latin America; Middle East; North America; South Asia; Sub-Saharan Africa; Western Europe

PROVINCE/STATE: California; Gujarat; Maharashtra

SIC CODES/DESCRIPTIONS: 9721 (International Affairs); 7372 (Prepackaged Software); 6020 (Commercial Banks); 8611 (Business Associations); 6300 (Insurance Carriers); 9111 (Executive Offices); 2700 (Printing & Publishing); 4812 (Radiotelephone Communications); 4581 (Airports Flying Fields & Services); 9700 (National Security & International Affairs); 2711 (Newspapers); 6022 (State Commercial Banks); 8600 (Membership Organizations); 9199 (General Government NEC); 4810 (Telephone Communications); 4789 (Transportation Services NEC); 9100 (Executive Legislative & General); 6030 (Savings Institutions); 8399 (Social Services NEC); 6000 (Depository Institutions); 4800 (Communications); 7300 (Business Services); 4200 (Trucking & Warehousing)

NAICS CODES/DESCRIPTIONS: 4881 (Air Transportation Support Activities); 48811 (Airport Operations); 513 (Broadcasting & Telecommunications); 81391 (Business Associations); 8139 (Business Labor Political & Like Organizations); 513322 (Cellular & Other Wireless Telecommunications); 52221 (Credit Card Issuing); 522 (Credit Intermediation & Related Activities); 92111 (Executive Offices); 52 (Finance & Insurance); 9211 (General Government Administration); 51 (Information); 5241 (Insurance Carriers); 524 (Insurance Carriers & Related Activities); 92812 (International Affairs); 928 (National Security & International Affairs); 5222 (Nondepository Credit Intermediation); 81 (Other Services exc Public Admin); 323 (Printing & Related Support Activities); 92 (Public Admin); 511 (Publishing Industries); 813 (Religious Grantmaking Professional & Like Organizations); 51121 (Software Publishers); 5133 (Telecommunications); 48 (Transportation & Warehousing); 488 (Transportation Support Activities); 51332 (Wireless Telecom Carriers exc Satellite)

... with Maximus as the prime with EDS, ISI, Datatrack, and SEIT, has sub contractor to **bid** and ultimately win the RFP to field the TWIC pilot test, which is still an...

... image) dark in this image but it is obviously there, 2D bar code, and this **sample** card we put in a contact with IC to show that that too is capable. There is a zone **reserve** to it whether a contact chip can be added, the contact chips are added simply... a new live scan of the cardholder here and a score of how well that **match** the image stored on the card. So, if the live scan to card **match** the score then -- if it's above the certain **threshold** , changes the finger print image on the screen to green, meaning that it's a...

?

File 15:ABI/Inform(R) 1971-2005/May 14

File 16:Gale Group PROMT(R) 1990-2005/May 13

```
File 148:Gale Group Trade & Industry DB 1976-2005/May 16
         (c)2005 The Gale Group
File 160:Gale Group PROMT(R) 1972-1989
         (c) 1999 The Gale Group
File 275:Gale Group Computer DB(TM) 1983-2005/May 16
         (c) 2005 The Gale Group
File 621:Gale Group New Prod.Annou.(R) 1985-2005/May 16
         (c) 2005 The Gale Group
File 626:Bond Buyer Full Text 1981-2005/May 16
         (c) 2005 Bond Buyer
File 608:KR/T Bus.News. 1992-2005/May 16
         (c)2005 Knight Ridder/Tribune Bus News
File   9:Business & Industry(R) Jul/1994-2005/May 13
         (c) 2005  The Gale Group
File  20:Dialog Global Reporter 1997-2005/May 16
         (c) 2005 The Dialog Corp.
File 623:Business Week 1985-2005/May 12
         (c) 2005 The McGraw-Hill Companies Inc
File 624:McGraw-Hill Publications 1985-2005/May 12
         (c) 2005 McGraw-Hill Co. Inc
File 636:Gale Group Newsletter DB(TM) 1987-2005/May 16
         (c) 2005 The Gale Group
File 813:PR Newswire 1987-1999/Apr 30
         (c) 1999 PR Newswire Association Inc
File 810:Business Wire 1986-1999/Feb 28
         (c) 1999 Business Wire
File 610:Business Wire 1999-2005/May 16
         (c) 2005 Business Wire.
File 476:Financial Times Fulltext 1982-2005/May 16
         (c) 2005 Financial Times Ltd
File 613:PR Newswire 1999-2005/May 16
         (c) 2005 PR Newswire Association Inc
File 634:San Jose Mercury  Jun 1985-2005/May 14
         (c) 2005 San Jose Mercury News
File 625:American Banker Publications 1981-2005/May 16
         (c) 2005 American Banker

Set     Items   Description
S1    5935027   BID? OR BIDDING OR AUCTION OR AUCTIONING OR MATCHING OR MA-
             TCH
S2    1503525   SAMPLE OR SAMPLING
S3       5966   RANDOM (N) NUMBER
S4          0   MAKERT (N) (PRICE OR VALUE OR COST)
S5     148332   BASELINE
S6     244142   THRESHOLD
S7    1735193   RESERVE
S8     608573   MARKET () (PRICE OR VALUE OR COST)
S9          0   S1(S)S2(S)S3(S)S8(S)S6
S10        13   S1(S)S2(S)S3
S11        10   RD (unique items)
S12         1   S1(S)S2(S)S8(S)S6
S13         1   S1(S)S2(S)S5(S)S6
S14         2   S1(S)S2(S)S6(S)S7
?
Temp SearchSave "BID" stored
?
>>>          77 is unauthorized
>>>         233 does not exist
>>>2 of the specified files are not available
       16may05 08:22:59 User264706 Session D136.3
            $3.86    0.715 DialUnits File15
               $3.40  1 Type(s) in Format  9
               $1.30  5 Type(s) in Format 95 (KWIC)
            $4.70  6 Types
     $8.56  Estimated cost File15
            $7.15    1.324 DialUnits File16
```

```
              $0.26  1 Type(s) in Format 95 (KWIC)
           $0.26  1 Types
    $7.41  Estimated cost File16
           $9.09    1.684 DialUnits File148
              $3.45  1 Type(s) in Format  9
              $1.04  4 Type(s) in Format 95 (KWIC)
           $4.49  5 Types
   $13.58  Estimated cost File148
           $0.59    0.109 DialUnits File160
    $0.59  Estimated cost File160
           $1.15    0.213 DialUnits File275
    $1.15  Estimated cost File275
           $2.56    0.473 DialUnits File621
    $2.56  Estimated cost File621
           $0.70    0.160 DialUnits File626
    $0.70  Estimated cost File626
           $0.27    0.271 DialUnits File608
    $0.27  Estimated cost File608
           $2.86    0.529 DialUnits File9
    $2.86  Estimated cost File9
           $3.04    3.035 DialUnits File20
              $0.00  2 Type(s) in Format 95 (KWIC)
           $0.00  2 Types
    $3.04  Estimated cost File20
           $0.38    0.067 DialUnits File623
    $0.38  Estimated cost File623
           $1.29    0.229 DialUnits File624
    $1.29  Estimated cost File624
           $2.90    0.538 DialUnits File636
    $2.90  Estimated cost File636
           $0.18    0.176 DialUnits File813
    $0.18  Estimated cost File813
           $0.18    0.176 DialUnits File810
    $0.18  Estimated cost File810
           $0.26    0.256 DialUnits File610
    $0.26  Estimated cost File610
           $0.28    0.284 DialUnits File476
    $0.28  Estimated cost File476
           $0.25    0.251 DialUnits File613
    $0.25  Estimated cost File613
           $0.10    0.100 DialUnits File634
    $0.10  Estimated cost File634
           $0.70    0.113 DialUnits File625
    $0.70  Estimated cost File625
           OneSearch, 20 files, 10.702 DialUnits FileOS
    $4.80  TELNET
   $52.04  Estimated cost this search
   $59.00  Estimated total session cost  11.964 DialUnits


SYSTEM:OS  - DIALOG OneSearch
  File   2:INSPEC 1969-2005/May W2
         (c) 2005 Institution of Electrical Engineers
  File  65:Inside Conferences 1993-2005/May W2
         (c) 2005 BLDSC all rts. reserv.
  File  99:Wilson Appl. Sci & Tech Abs 1983-2005/Apr
         (c) 2005 The HW Wilson Co.
  File 583:Gale Group Globalbase(TM) 1986-2002/Dec 13
         (c) 2002 The Gale Group
*File 583: This file is no longer updating as of 12-13-2002.
  File  35:Dissertation Abs Online 1861-2005/Apr
         (c) 2005 ProQuest Info&Learning
  File 474:New York Times Abs 1969-2005/May 13
         (c) 2005 The New York Times
  File 475:Wall Street Journal Abs 1973-2005/May 13
         (c) 2005 The New York Times
```

```
  File 169:Insurance Periodicals 1984-1999/Nov 15
         (c) 1999 NILS Publishing Co.
*File 169: This file is closed (no longer updating).
  File 139:EconLit 1969-2005/May
         (c) 2005 American Economic Association

      Set  Items  Description
      ---  -----  -----------
?
Name:     BID
Modified: 16may05
 Line Commands:
----- ---------
   1. SET HI
   2. S BID? OR BIDDING OR AUCTION OR AUCTIONING OR MATCHING OR MATCH
   3. S SAMPLE OR SAMPLING
   4. S RANDOM (N) NUMBER
   5. S MAKERT (N) (PRICE OR VALUE OR COST)
   6. S BASELINE
   7. S THRESHOLD
   8. S RESERVE
   9. S MARKET () (PRICE OR VALUE OR COST)
  10. S S1(S)S2(S)S3(S)S8(S)S6
  11. S S1(S)S2(S)S3
  12. RD
  13. S S1(S)S2(S)S8(S)S6
  14. S S1(S)S2(S)S5(S)S6
  15. S S1(S)S2(S)S6(S)S7
Note:  To view an address, enter RECALL ADDRESS <name>
?
          160263  BID?
           18531  BIDDING
           20530  AUCTION
             799  AUCTIONING
          108334  MATCHING
           57619  MATCH
      S1  331546  BID? OR BIDDING OR AUCTION OR AUCTIONING OR MATCHING OR
                  MATCH
          359463  SAMPLE
          105908  SAMPLING
      S2  440592  SAMPLE OR SAMPLING
          240647  RANDOM
         1164632  NUMBER
      S3    4006  RANDOM (N) NUMBER
               0  MAKERT
          296390  PRICE
          651865  VALUE
          566186  COST
      S4       0  MAKERT (N) (PRICE OR VALUE OR COST)
      S5   30099  BASELINE
      S6  156661  THRESHOLD
      S7   53098  RESERVE
         1060166  MARKET
          296390  PRICE
          651865  VALUE
          566186  COST
      S8   10462  MARKET () (PRICE OR VALUE OR COST)
?
          331546  S1
          440592  S2
      S9    7435  S1 AND S2
?
            7435  S9
            4006  S3
     S10       9  S9 AND S3
?
```

...completed examining records
S11 9 RD (unique items)
?
>>>'-' not allowed as format type
?
>>>"FREE" is not a valid format name in file(s): 139

11/K/1 (Item 1 from file: 2)

8216841 INSPEC Abstract Number: A2005-03-0540-024
Title: A statistical reason for the appearance of 1/f spectra from not perfectly continuous processes
Publication Date: June 2004
Document Type: Journal Paper (JP)
Treatment: Theoretical (T)
Descriptors: 1/f noise; fluctuations; random processes; stochastic processes
Identifiers: 1/f spectra; nonperfect continuous processes; spectral estimate; stochastic process; stochastic continuity; randomly indexed random walk; random increments; pointlike events; recorded data; random variance component; fixed variance component; fluctuation phenomena
Class Codes: A0540 (Fluctuation phenomena, random processes, and Brownian motion); A0250 (Probability theory, stochastic processes, and statistics)

...Abstract: derivation of the spectral estimate for data from a stochastic process that does not perfectly **match** the common supposition of stochastic continuity. The used model is a Randomly Indexed Random Walk that supposes the data of every **sampling** interval as the sum of a finite **random number** of random independent increments. This corresponds to the discreteness of the state space of electron...

11/K/2 (Item 2 from file: 2)

7890129 INSPEC Abstract Number: C2004-04-7310-042
Title: Behavior of the NORTA method for correlated random vector generation as the dimension increases
Publication Date: July 2003
Document Type: Journal Paper (JP)
Treatment: Practical (P); Theoretical (T)
Descriptors: correlation methods; matrix algebra; numerical analysis; **random number** generation; **sampling** methods; simulation
Identifiers: NORTA method; NORmal To Anything method; random vector generation; correlation matrix; symmetric positive definite matrix; onion method; finite dimensional matrix
Class Codes: C7310 (Mathematics computing); C1220 (Simulation, modelling and identification); C1140Z (Other topics in statistics); C4140 (Linear algebra (numerical analysis))

...Abstract: is known that there exist marginal distributions and correlation matrices that the NORTA method cannot **match** , even though a random vector with the prescribed qualities exists. We investigate this problem as...
... performs well with increasing dimension. As part of our analysis, we develop a method for **sampling** correlation matrices uniformly (in a certain precise sense) from the set of all such matrices. This procedure can be used more generally for **sampling** uniformly from the space of all symmetric positive definite matrices with diagonal elements fixed at...
...Descriptors: **random number** generation...

... **sampling** methods

11/K/3 (Item 3 from file: 2)

5895359 INSPEC Abstract Number: B9806-2550F-011, C9806-7410H-001
Title: Void phenomena in passivated metal lines: recent observations and interpretation
Publication Date: 1998
Document Type: Conference Paper (PA); Journal Paper (JP)
Treatment: Practical (P); Theoretical (T); Experimental (X)
Descriptors: computerised instrumentation; cracks; electromigration; image **matching** ; integrated circuit interconnections; integrated circuit measurement; integrated circuit metallisation; integrated circuit testing; nucleation; passivation; scanning electron microscopy; voids (solid
Identifiers: void phenomena; passivated metal lines; in-situ electromigration observation; passivated metal; lifetime measurements; post-mortem failed specimen examination; modeling; life tests; SEM technology; HVSEM; high voltage scanning electron microscopy; computer control; computer generated scan; raster shape **matching** ; line lifetime; incubation period; voids; chaotic void behaviour; dielectric cracking; void coalescence; line failure; grain boundary defect; void nucleation site; void initiation sites; nucleation sites; void dynamics; line lifetime variance
Class Codes: B2550F (Metallisation and interconnection technology); B2570 (Semiconductor integrated circuits); B2550E (Surface treatment for semiconductor devices); B7210B (Automatic test and measurement systems); B6140C (Optical information, image and video signal processing); C7410H (Computerised instrumentation); C5260B (Computer vision and image processing techniques); C7410D (Electronic engineering computing)

...Abstract: as a video, the complete life history of an entire line. The life of a **sample** generally consists of three stages: an extended incubation period with no visible changes; a period...

... that is extremely small relative to the number of grains in the film. The small, **random number** of nucleation sites, and the chaotic nature of void dynamics account for the large line...
...Descriptors: image **matching** ;
...Identifiers: raster shape **matching** ;

11/K/4 (Item 4 from file: 2)

4838394 INSPEC Abstract Number: C9501-6185-009
Title: A flexible method for estimating inverse distribution functions in simulation experiments
Publication Date: Fall 1994
Document Type: Journal Paper (JP)
Treatment: Theoretical (T)
Descriptors: discrete event simulation; **random number** generation; statistical analysis
Identifiers: inverse distribution functions; simulation experiments; random variates; continuous distribution; IDPF; discrete event simulation
Class Codes: C6185 (Simulation techniques); C1140 (Probability and statistics); C1220 (Simulation, modelling and identification)

...Abstract: we present procedure IDPF-a flexible technique for estimating the associated inverse distribution function from **sample** data and for generating variates from the fitted distribution by inversion. To

motivate IDPF, first...

... initial Inverse distribution function by a standard technique, we estimate a polynomial "filter" for the **random - number** input by constrained nonlinear regression to achieve minimum "distance" between the empirical inverse distribution and...

... Monte Carlo study illustrates the effectiveness of IDPF. Compared to initial Johnson distributions selected by **matching** moments, IDPF-based fits are closer on the average to the corresponding empirical and theoretical...

...Descriptors: **random number** generation

11/K/5 (Item 5 from file: 2)

02895429 INSPEC Abstract Number: C87031545

Title: Sample **-based nonuniform random variate generation**

Publication Date: 1986

Document Type: Conference Paper (PA)

Treatment: Theoretical (T)

Descriptors: **random number** generation; statistical analysis

Identifiers: **sample** -based random variate generation; independent identically distributed random variables; nonuniform random variate generation; density; iid random variables; **sample** independence; consistency; **sample** indistinguishability; moment **matching** ; generator efficiency; replacement number

Class Codes: C1140Z (Other and miscellaneous)

Title: Sample **-based nonuniform random variate generation**

Abstract: A **sample** of n independent identically distributed (iid) random variables is given. All have the same density, which is unknown. Several issues related to the problem of generating a new **sample** of iid random variables with almost the same density are discussed, with emphasis on **sample** independence, consistency, **sample** indistinguishability, moment **matching** , and generator efficiency. The author introduces the notion of a replacement number, the minimum number of observations in a given **sample** that have to be replaced to obtain a new **sample** with a given density.

Descriptors: **random number** generation...

Identifiers: **sample** -based random variate generation...

... **sample** independence...

... **sample** indistinguishability...

...moment **matching** ;

11/K/6 (Item 6 from file: 2)

02339893 INSPEC Abstract Number: B84057898, C84052182

Title: 8 bit random generator

Publication Date: July 1984

Document Type: Journal Paper (JP)

Treatment: Practical (P)

Descriptors: **random number** generation; stochastic processes

Identifiers: 8 bit random generator; storage systems testing; simulation; stochastic procedures

Class Codes: B0240 (Probability and statistics); C1140 (Probability and statistics); C7890 (Other special applications); C7310 (Mathematics)

...Abstract: shows that it is often insufficient to test the banks one after another with unified **matching** tests since address interchangeability or data adulteration at bit **sampling** points pass unrecognised It is more purposeful to insert varied random texts for examination. A...
Descriptors: **random number** generation...

11/K/7 (Item 7 from file: 2)

02123072 INSPEC Abstract Number: B83053285, C83036510
Title: Remarks on a model of competitive bidding **for employment**
Publication Date: June 1983
Document Type: Journal Paper (JP)
Treatment: Theoretical (T)
Descriptors: game theory
Identifiers: branching process; **sample** extremes; competitive **bidding** ; employment; income distributions
Class Codes: B0240E (Game theory); C1140E (Game theory)

Title: Remarks on a model of competitive bidding **for employment**
...Abstract: of the present generation of individuals has the same distribution as the minimum of a **random number** N/sub n/ of independent copies of some random variable and (N/sub n/) is...
...Identifiers: **sample** extremes...

...competitive **bidding** ;

11/K/8 (Item 8 from file: 2)

00713907 INSPEC Abstract Number: A75007850
Title: Point processes of seasonal thunderstorm rainfall. II. Rainfall depth probabilities
Publication Date: June 1974
Document Type: Journal Paper (JP)
Treatment: Theoretical (T)
Descriptors: rain; statistical analysis; thunderstorms
Identifiers: point processes; seasonal thunderstorm rainfall; probabilistic nature; daily rainfall depths; homogeneity; pattern of occurrence; annual variance; population properties; effect of truncation; Markov chain dependence
Class Codes: A9260 (Meteorology)

...Abstract: such as annual total depths, is shown to be treatable as the sum of a **random number** of (independent) random variables by using the model for rainy day occurrence. Simulations from this model **match** well the measured data from the stations treated. The effect of truncation of the rainfall **sample** on both depth distribution and Markov chain dependence is discussed. It is also indicated how...

11/K/9 (Item 1 from file: 35)

01508703 ORDER NO: AAD96-33842
DRAW FIRST, THEN WRITE: KINDERGARTEN STUDENTS AS BEGINNING WRITERS (DRAWING)
Year: 1996

...However, the draw first group observed the modeling teacher drawing a picture and writing a **sample** relating to the lesson. The comparison

group of students observed the modeling teacher writing a **sample** only. The students wrote seven lessons over a seven-week period.
The student journals were...

...observations, and discussions were conducted by the researcher with the classroom teachers and with a **random number** of students involved in the study to determine teacher and student perceptions.
Significant differences were...

...of words written and the number of lines written.
The overall percentages of pictures drawn **matching** the words written were significantly high, ranging from 53% to 83%. The second lesson offered a decline in percentage of pictures **matching** words written, and after the third lesson the percentages began to decline, suggesting that the...

```
?
File   2:INSPEC 1969-2005/May W2
         (c) 2005 Institution of Electrical Engineers
File  65:Inside Conferences 1993-2005/May W2
         (c) 2005 BLDSC all rts. reserv.
File  99:Wilson Appl. Sci & Tech Abs 1983-2005/Apr
         (c) 2005 The HW Wilson Co.
File 583:Gale Group Globalbase(TM) 1986-2002/Dec 13
         (c) 2002 The Gale Group
File  35:Dissertation Abs Online 1861-2005/Apr
         (c) 2005 ProQuest Info&Learning
File 474:New York Times Abs 1969-2005/May 13
         (c) 2005 The New York Times
File 475:Wall Street Journal Abs 1973-2005/May 13
         (c) 2005 The New York Times
File 169:Insurance Periodicals 1984-1999/Nov 15
         (c) 1999 NILS Publishing Co.
File 139:EconLit 1969-2005/May
         (c) 2005 American Economic Association

Set     Items   Description
S1     331546   BID? OR BIDDING OR AUCTION OR AUCTIONING OR MATCHING OR MA-
             TCH
S2     440592   SAMPLE OR SAMPLING
S3       4006   RANDOM (N) NUMBER
S4          0   MAKERT (N) (PRICE OR VALUE OR COST)
S5      30099   BASELINE
S6     156661   THRESHOLD
S7      53098   RESERVE
S8      10462   MARKET () (PRICE OR VALUE OR COST)
S9       7435   S1 AND S2
S10         9   S9 AND S3
S11         9   RD (unique items)
?
            7435  S9
           30099  S5
          156661  S6
     S12       0  S9 AND S5 AND S6
?
            7435  S9
          156661  S6
           53098  S7
           10462  S8
     S13       0  S9 AND S6 AND S7 AND S8
?
            7435  S9
          156661  S6
           53098  S7
     S14       0  S9 AND S6 AND S7
?
            7435  S9
          156661  S6
```

```
     S15       96  S9 AND S6
?
?
               96  S15
            10462  S8
     S16        1  S15 AND S8
?
```

16/9/1 (Item 1 from file: 139)
DIALOG(R)File 139:EconLit

731398
TITLE: Trading Intensity, Volatility, and Arbitrage Activity
AUTHOR(S): Taylor, Nicholas
AUTHOR(S) AFFILIATION: Cardiff U
JOURNAL NAME: Journal of Banking and Finance,
JOURNAL VOLUME & ISSUE: 28 5,
PAGES: 1137-62
PUBLICATION DATE: 2004
AVAILABILTY:
http://www1.elsevier.com/homepage/sae/econworld/econbase/jbf/frame.htm
Publisher's URL
ISSN: 0378-4266
DOCUMENT TYPE: Journal Article
ABSTRACT INDICATOR: Abstract
ABSTRACT: The objective of this paper is to uncover the determinants of trading intensity in futures markets. In particular, the time between adjacent transactions (referred to as transaction duration) on the FTSE 100 index futures market is modeled using various augmentations of the basic autoregressive conditional duration (ACD) model introduced by Engle and Russell [Econometrica 66 (1998) 1127]. The definition of transaction duration used in this paper is an important variable as it represents the inverse of instantaneous conditional return volatility. As such, this paper can also be viewed as an investigation into the determinants of (the inverse of) instantaneous conditional return volatility. The estimated parameters from various ACD models form the basis of the hypothesis tests carried out in the paper. As predicted by various market microstructure theories, we find that **bid** -ask spread and transaction volume have a significant impact upon subsequent trading intensity. However, the major innovation of this paper is the finding that large (small) differences between the **market price** and the theoretical price of the futures contract (referred to as pricing error) lead to high (low) levels of trading intensity in the subsequent period. Moreover, the functional dependence between pricing error and transaction duration appears to be non-linear in nature. Such dependence is implied by the presence of arbitragers facing non-zero transaction costs. Finally, a comparison of the forecasting ability of the various estimated models shows that a **threshold** ACD model provides the best out-of- **sample** performance.
GEOGRAPHIC LOCATION DESCRIPTOR(S): U.K.
DESCRIPTOR(S) (1991 to Present): Asset Pricing (G120); Contingent Pricing; Futures Pricing; option pricing (G130); Arbitrage; Futures Market
?

```
File   2:INSPEC 1969-2005/May W2
         (c) 2005 Institution of Electrical Engineers
File  65:Inside Conferences 1993-2005/May W2
         (c) 2005 BLDSC all rts. reserv.
File  99:Wilson Appl. Sci & Tech Abs 1983-2005/Apr
         (c) 2005 The HW Wilson Co.
File 583:Gale Group Globalbase(TM) 1986-2002/Dec 13
         (c) 2002 The Gale Group
File  35:Dissertation Abs Online 1861-2005/Apr
         (c) 2005 ProQuest Info&Learning
File 474:New York Times Abs 1969-2005/May 13
         (c) 2005 The New York Times
```

```
File 475:Wall Street Journal Abs 1973-2005/May 13
         (c) 2005 The New York Times
File 169:Insurance Periodicals 1984-1999/Nov 15
         (c) 1999 NILS Publishing Co.
File 139:EconLit 1969-2005/May
         (c) 2005 American Economic Association

Set      Items   Description
S1      331546   BID? OR BIDDING OR AUCTION OR AUCTIONING OR MATCHING OR MA-
              TCH
S2      440592   SAMPLE OR SAMPLING
S3        4006   RANDOM (N) NUMBER
S4           0   MAKERT (N) (PRICE OR VALUE OR COST)
S5       30099   BASELINE
S6      156661   THRESHOLD
S7       53098   RESERVE
S8       10462   MARKET () (PRICE OR VALUE OR COST)
S9        7435   S1 AND S2
S10          9   S9 AND S3
S11          9   RD (unique items)
S12          0   S9 AND S5 AND S6
S13          0   S9 AND S6 AND S7 AND S8
S14          0   S9 AND S6 AND S7
S15         96   S9 AND S6
S16          1   S15 AND S8
?
       16may05 08:30:29 User264706 Session D136.4
            $6.40    0.775 DialUnits File2
               $1.60  8 Type(s) in Format 95 (KWIC)
            $1.60  8 Types
     $8.00  Estimated cost File2
            $0.39    0.105 DialUnits File65
     $0.39  Estimated cost File65
            $0.72    0.169 DialUnits File99
     $0.72  Estimated cost File99
            $1.22    0.365 DialUnits File583
     $1.22  Estimated cost File583
            $1.07    0.260 DialUnits File35
               $0.10  1 Type(s) in Format 95 (KWIC)
            $0.10  1 Types
     $1.17  Estimated cost File35
            $0.59    0.169 DialUnits File474
     $0.59  Estimated cost File474
            $0.54    0.155 DialUnits File475
     $0.54  Estimated cost File475
            $0.25    0.109 DialUnits File169
     $0.25  Estimated cost File169
            $0.57    0.169 DialUnits File139
               $0.85  1 Type(s) in Format  9
            $0.85  1 Types
     $1.42  Estimated cost File139
            OneSearch, 9 files,  2.276 DialUnits FileOS
     $2.13  TELNET
    $16.43  Estimated cost this search
    $75.43  Estimated total session cost  14.240 DialUnits


SYSTEM:OS  - DIALOG OneSearch
  File 348:EUROPEAN PATENTS 1978-2005/May W02
         (c) 2005 European Patent Office
  File 349:PCT FULLTEXT 1979-2005/UB=20050512,UT=20050505
         (c) 2005 WIPO/Univentio
  File 347:JAPIO Nov 1976-2005/Jan(Updated 050506)
         (c) 2005 JPO & JAPIO

      Set  Items  Description
```

```
    ---  -----  -----------
?
Name:     BID
Modified: 16may05
 Line Commands:
----- ---------
   1. SET HI
   2. S BID? OR BIDDING OR AUCTION OR AUCTIONING OR MATCHING OR MATCH
   3. S SAMPLE OR SAMPLING
   4. S RANDOM (N) NUMBER
   5. S MAKERT (N) (PRICE OR VALUE OR COST)
   6. S BASELINE
   7. S THRESHOLD
   8. S RESERVE
   9. S MARKET () (PRICE OR VALUE OR COST)
  10. S S1(S)S2(S)S3(S)S8(S)S6
  11. S S1(S)S2(S)S3
  12. RD
  13. S S1(S)S2(S)S8(S)S6
  14. S S1(S)S2(S)S5(S)S6
  15. S S1(S)S2(S)S6(S)S7
Note:  To view an address, enter RECALL ADDRESS <name>
?
>>>Invalid syntax at or near BID
?
           66116  BID?
            1846  BIDDING
            3235  AUCTION
             384  AUCTIONING
          158038  MATCHING
          150537  MATCH
     S1   315440  BID? OR BIDDING OR AUCTION OR AUCTIONING OR MATCHING OR
                  MATCH
          391807  SAMPLE
          119908  SAMPLING
     S2   453534  SAMPLE OR SAMPLING
          206071  RANDOM
         1559661  NUMBER
     S3    14393  RANDOM (N) NUMBER
               0  MAKERT
           57479  PRICE
         1242997  VALUE
          652340  COST
     S4        0  MAKERT (N) (PRICE OR VALUE OR COST)
     S5    31678  BASELINE
     S6   196596  THRESHOLD
     S7    38698  RESERVE
           76592  MARKET
           57479  PRICE
         1242997  VALUE
          652340  COST
     S8     2131  MARKET () (PRICE OR VALUE OR COST)
?
          315440  S1
          453534  S2
           14393  S3
           31678  S5
          196596  S6
     S9       79  S1 AND S2 AND S3 AND S5 AND S6
?
              79  S9
            2131  S8
    S10        1  S9 AND S8
?
>>>"FREE" is not a valid format name in file(s): 347-349
?
```

10/K/1 (Item 1 from file: 349)

Fulltext Availability:
Detailed Description
Claims

Detailed Description
... network, similar to synapse strengths, are adapted in such a way that tlle actual outputs **match** the desired outputs, across some range of examples. If properly trained, good results are obtained...physical
plants or networks being controlled. Unfortunately, the distribution of efforts between neurons does not **match** the structure of the physical plant, for ordinary neural network designs; for example, the most...to know what is
the value of a specific object? For example, what is the **market value** of a peanut? An economist would say that this is an easy question. The value...See B.Widrow, N.Gupta & S.Maitra, Punish/reward: learning with a Critic in adaptive **threshold** systems, IEEE Trans. SMC, 1973, Vol. 5, p 465.)
- In any event, the BSA design...of "window" in time. He said that he found that
the'-usual millisecond-or-so **sampling** time of the neocortex actually contains only a 30-40 millisecond "window" for the forward...t+l) - J(t) plus a local downstairs U(t) component calculated at a higher **sampling** rate; the actual feedback may involve derivatives of all these quantities. The local U(t...

Claim
... a real-time control
system, the interval between time t and time t+l (the **sampling** interval) may be very short. The literature on artificial intelligence has stressed the need to...are exact; by contrast, equation 32
involves the usual random disturbances associated with any statistical **sampling** method, without any real cost advantage.
1,4 From Passive Desi@jn to Active Desi...higher-level decision is made (based on this
maximization), we update Ji so as to **match** the target value of the right-hand side of this equation, which yields a backwards...the adaptation methods in the adaptive critic
literature, one can use -- in theory -- "almost any" **sampling** strategy which is mixed and diverse enough to eventually touch base with all relevant states...

...be used, for example, to trigger higher
probabilities of reconsideration, above a lower but nonzero **baseline** probability which always applies.)
When such reconsideration is allowed, one can keep track of the...insert a neural network to receive as
inputs i, A, anduA, and train it to **match** the targets given in equation 38. Instead of an integer "i," one would use r...

...a network which inputs r, A, u,,, and
J-,", and again to train it to **match** the targets implied by equation 39.
However, for a true neural network approximation, we cannot...1 In theory,
we could certainly merge the two networks into one network, trained to **match** the sum of the two targets; however, this is not the preferred variant of the...

...or some other supervised learning method able
to adapt such hidden layers) in order to **match** jAO (r) +jAl (r).

This provides a kind of compression technique, similar to the "bottleneck...choosing
decision A in an initial state i. Note the importance of training JA' to **match** jBC+jH1 for the resulting state j, after the subsequent decision B is known; by...

...important in some cases.
Thirdly, the operations described above -- including the use of forwards results **sampling** in order to evaluate possible decisions and to train decision networks -- clearly require the existence...except of
course for itself. It would be trained by supervised learning, in order to **match** the goals g'- which are later developed by the following decision block, after the following...

...is used.
Actually, there are good reasons to weight this supervised learning, to try to **match** gl@ to g'- more energetically in some situations that in others. Higher weights should be...of J' information, in effect, makes this a more passive. less modular approach than our **baseline** architecture. It is also less plausible than the base architecture as a description of mammalian...be worth the trouble; however, it may be worth
considering as an extension, after the **baseline** system is more fully tested.
Finally, in the design of J'- networks, it is important...array of spatially-located
data, and also outputs an array of spatially located outputs (t7o **match** a spatially located array of targets).
There is a straightforward but novel generalization of that...brain: an engineering
interpretation. For reasons discussed therein, this system cannot operate at the maximal **sampling** rate which the underlying hardware seems capable of. In order to perform true maximal-rate...To take this process further, and develop a more serious second-order understanding of the **match** between ADP and specific connections and cell types in the brain, would require a substantial...particular task.
In practical applications today, computations are mainly based on discrete time cycles or **sampling** rates, rather than differential equations. In the discrete time formulation, tKi@re are& two related...style of
computation, with a high-speed inner recurrent loop embedded within a lower-speed **sampling** system, in order to perform the same task. For the maze problem, however, we were...weights were set by hand,
very arbitrarily; unfortunately, since we had problems seeding the Unix **random number** generator.) This experience fits in with a kind of Murphy's Law mentioned by Werbos...of such networks, it is important to
consider the clock rates of computation and data **sampling** . For that reason, it is both easier and better to use error minimizing designs based...not vice versa. To consider the functions which an MLP can represent, we can simply **sample** a set of randomly selected MLPs, and then test the ability of SRNs to learn...

...picking Net A, we always used the same
feed-forward structure. But we used a **random number** generator to set the weights. After Net A was chosen and Net B was initialized...first three conditions, or which come a little closer to a fifth desirable condition (to **match** all the specific cell types in the brain in a comprehensive, testable manner), but none...efficient
manner, and the cost of the computations can become a problem,

especially when millisecond **sampling** times are required. The adaptive critic approach -- broadly defined -- is the only type of design...in the brains of vertebrates should try to meet.all three validation standards -- it should **match** the neural circuitry, it should **match** the existing behavioral experiments, and it must explain how the brain achieves a very high...In the ANN field, a generic system which learns to generate outputs Y(t) which **match** some desired target values Y*(t), over time, is called a "supervised learning system." But...where the set of random numbers "noise" may either be simulated by use of a **random number** generator or deduced from an actual estimate of R(t). We can try to adapt...lower-level adaptive critic system. However, because the lower system is based on a higher **sampling** rate, one would expect it to add in a few additional components of utility, such...training signals to the cerebellum from the olive do seem to involve a low-frequency **sampling** rate (like that of the upper brain), even though the cerebellum itself operates with an...definition of utility (U); (2) an upper-level ADP system which operates on a (clocked) **sampling** time on the order of 1/10-1/4 second; (3) a lower-level ADP system which operates on an effective **sampling** time on the order of 0.01 second. In other words, there is a kind...

?

```
File 348:EUROPEAN PATENTS 1978-2005/May W02
         (c) 2005 European Patent Office
File 349:PCT FULLTEXT 1979-2005/UB=20050512,UT=20050505
         (c) 2005 WIPO/Univentio
File 347:JAPIO Nov 1976-2005/Jan(Updated 050506)
         (c) 2005 JPO & JAPIO

Set     Items   Description
S1     315440   BID? OR BIDDING OR AUCTION OR AUCTIONING OR MATCHING OR MA-
             TCH
S2     453534   SAMPLE OR SAMPLING
S3      14393   RANDOM (N) NUMBER
S4          0   MAKERT (N) (PRICE OR VALUE OR COST)
S5      31678   BASELINE
S6     196596   THRESHOLD
S7      38698   RESERVE
S8       2131   MARKET () (PRICE OR VALUE OR COST)
S9         79   S1 AND S2 AND S3 AND S5 AND S6
S10         1   S9 AND S8
?
          315440  S1
          453534  S2
           14393  S3
          196596  S6
            2131  S8
     S11       8  S1 AND S2 AND S3 AND S6 AND S8
?
```

11/K/1 (Item 1 from file: 348)

DIALOG(R)File 348:(c) 2005 European Patent Office. All rts. reserv.

...SPECIFICATION hours in advance, the load forecast on the system and asks interested suppliers to submit **bids** ; i.e., amount of power to be delivered at each point and pricing information. The load forecast is given for each delivery point within the physical system. **Bids** are submitted to the Power Exchange or PX which then holds an **auction** to determine which suppliers to buy power from. For each delivery point, the PX chooses...

...process ensures that the customers' demand for electricity is satisfied at a minimal cost. The **bidding** cost of last supplier chosen in the

bidding process is the spot- **market** **price** for power at this delivery point. The PX performs this process for each delivery point...

...and billed to the different parties involved in trades. Note that suppliers who submit a **bid** with a high price may end up not selling any of their production. On the...

...generator. Given that no one knows in advance the amount of power that competitors may **bid** for, the electric-power market will become more uncertain and risky. The hope is that...

...method comprising the steps of:

inputting maximum generating capacities of each utility competing within the **market** , **price** functions at which a utility is willing to sell its power at a given time...

...for the spot-market prices and for electric trades in the system are created by **sampling** from electric load, price functions and cost distributions to create a sequence of deterministic models...

...said system comprising:

means for inputting maximum generating capacities of each utility competing within the **market** , **price** functions at which a utility is willing to sell its power at a given time...points comprising the steps of:

inputting maximum generating capacities of each utility competing within the **market** , **price** functions at which a utility is willing to sell its power at a given time...

...for the spot-market prices and for electric trades in the system are created by **sampling** from electric load, price functions and cost distributions to create a sequence of deterministic models...

...set of price functions, transmission costs and electric loads; and storing a resulting output. The **sampling** from electric load, transmission costs and cost distributions is performed using a **random number** generator.

Thus the computer implemented process described herein forecasts the spot-market prices and the...

...risk to be acceptably contained. The first column in the above table represents the spot **market** **price** . The second column contains the amount of power that may be traded. Note that for...

...the process;

Figure 6 is a flow diagram of a process that generates a random **sample** ; and

Figure 7 is a flow diagram showing the bucketing process used to create a...profit margins is then solved for each one of these combinations to produce a spot- **market** **price** and to compute the trades. The results can be bucketed to form a distribution of...hard to perform all of the previous calculations in a reasonable time. Instead, one can **sample** from the electric-load and cost distributions to create a sequence of deterministic models. The **sampling** process (i.e., simulation) is an approximation of the exhaustive one described above. The **sampling** process is repeated until a reasonable approximation is reached of the distributions of trades and...

...number, L, of samples is chosen.

Consider the market equilibrium at time t under a **sample** of price functions fi)), i=1,...,n, transmission costs ci,j)), i=1,...,n, j...

...indices t, s and k to simplify notations. Due to the competition resulting from the **bidding** process, we expect the spot price to be the minimum cost at which the demand...

...cost of power at point i. That is, it is an estimate of the spot- **market** **price** at i under the given demand and price functions.

We repeat the previous process by **sampling** a new set of price functions and electric loads then resolving the model. The **sampling** process continues until changes in the distribution of spot prices and the decision variables xi,j)) are within a pre-specified **threshold** . Another possibility is to repeat the process for a fixed number, L, of samples.

The flow chart of Figure 5 describes the **sampling** process. It starts in function block 51 in which the time index, t, is set to 1. The process then proceeds to function block 52 in which the **sample** counter, (liters), is set to one. Note that whenever we select a new **sample** , i.e., price functions, transmission costs, and transmission capacities, the value of (liters) is incremented...

...the different nodes of the network is sampled. This step, function block 54, calls the **sampling** procedure of Figure 6 which returns a set of price functions, electric loads, and transmission...

...the system. The process is then directed to function block 53 in which a new **sample** is generated. After reaching the maximum number of samples in decision block 53, the process...

...function block 54 of Figure 5 calls the process of Figure 6 which performs the **sampling** . The **sampling** process is performed using a uniform **random** **number** generator. Uniform **random** **number** generators are available on most computers and under any programming language. For example, the C electric-load probabilities, (pi)t))k), to come up with a **sample** . The process of Figure 6 receives from the calling process (function block 54 of Figure 5) the value of t. In function block 601, a **random** **number** x between 0 and 1 is sampled from the uniform distribution. Function block 602 defines...
...and at each time period of the planning horizon. Here, the superscript (liters) indicates the **sample** index. We also obtain the power flow, y(liters)(i,j),t , in the different...

...t is greater than zero, then node i is transmitting power to node j under **sample** (liters) of our simulation. Of course, if y(liters)(i,j),t>0, then...

...of the counter mj)) is incremented by 1 in function block 73 to account for **sample** j. Function block 74 increases the value of (liters) by 1; i.e., we are ready to process a new **sample** if any. Decision block 75 checks if (liters) is less than L. If this is...

...CLAIMS method comprising the steps of:
inputting maximum generating capacities of each utility competing within the **market** , **price** functions at which a utility is willing to sell its power at a given time...

...for the spot-market prices and for electric trades in the system are created by **sampling** from electric load, price functions and cost distributions to create a sequence of deterministic models...

...said system comprising:
means for inputting maximum generating capacities of each utility competing within the **market** , **price** functions at which a utility is willing to sell its power at a given time...

11/K/2 (Item 1 from file: 349)

Fulltext Availability:
Detailed Description

Detailed Description
... to provide input for pricing insurance policies at a level that

assures adequate reserves, can **match** assets with liabilities, and can evaluate different strategies. The present model will calculate the probability...vary country to country.

14
[0068] Interest rate risk is determined by the cash flow **matching** method. In particular, expected cash inflow from all assets and the cash outflow from all...it were a fixed income security with financial options attached, the well-known "cash flow **matching** " technique is used to determine net present value. In order to use this method, historical... behaviors of insurance contract customers guide the present model to generate multiple cancellation scenarios.

22
random number to decide whether each insurance contract will be modeled as cancelled or not, and the...B, are re-ordered. Denote the rearranged matrix -4 as Z.

[001291 Generate uniform Quasi- **Random number** point sets
i i i
@U @Ui@ ... @U
(UO 1 2 1-1
III i...risk 5 factors Ar, by Ari = o-izi.

[001321 We next implement the uniform quasi- **random number** generator based on lattice rules. Korobov rules are a special case of lattice rules that are easy to implement.

The point set P, for a given **sample** size n, is equal to the set of all vectors of t (t is the...

...Uj = Yj In.

where the initial point yo E 10,1,... n - 11. The quasi- **random number** set is pi, = XU0 @ U1 @ ... @Ut-l) VY01.

[00133] The following table gives the best multipliers a corresponding to certain **sample** size n, in terms of the criteria that some of the low-dimensional projections be...PVI, (C,) to the right vertex.

[001731 We assume that the log return on the **market value** of a risk-free zero coupon bond follows a conditional normal distribution (using the same...

...zero coupon bond with maturity t that coincides with any one of the vertices, the **market value** distribution at time horizon h is given by the following equation.

MVII (F,) = P VI...face value of the risk-free zero coupon bond into the corresponding vertices, and the **market value** distribution can then be evaluated accordingly.

.WI (FI) = a - P VI, (Ff)e Rt, + (1...

...right vertices.

[001751 As any risk-free bond can be decomposed into cash flows, the **market value** distribution of a portfolio of risk-free coupon bonds can be evaluated by the following...the above steps for every bond in the portfolio and sum up V.'
[00177] The **market value** of the portfolio is
= y Z Vj Rl,
MJ71, j 11
11 everficesJ
where R...

...be applies to the above formula in order to evaluate the distribution of the
/I
market **value** of a bond or a portfolio of bonds.

[00178] ...cash flow and group it under second to last vertex.

F. RIS14CY BONDS
[00180] The **market** **value** of a risky bond V,, at horizon h can be written as.

Z I Z31...factors, equity indices being some of them), the condition that r,," is less than a **threshold** z' becomes
z" - w r'
< e n
F-n
W.

39
[001861 The conditional default...

...1 -Wf" 7411"s in
W(2
W('2
[001871 The conditional mean of the **market** **value** of the ...Hence
Bs(r) s#m
Er [Bs F-RFV
[001891 The conditional variance of the **market** **value** of the risky bond is
2 [(p
M)2
(r,', r) = Er 11
I
=Er...f (O -2)
F2
@', +RFV S=M
[001901 Assume we have N risky bonds and **market** **value** of bond i at horizon h is V11.
N
[hiS
Fi, = E E sB'l...0-2 (r).

V
" I'
N(M(r)'0
2 (r)).

[001971 In simulation, the **market** **value** distribution of a portfolio of risky coupon bonds can be evaluated by the following procedure... portfolio: m(r) m, (r,', r) ando-2 (r) =ZU2 (ri', r) . Next, generate a **random** **number** VI, Ir- N(m(r), U2 (r)), which will be the realized portfolio **market** **value** .

G. CALLABLE BONDS
[002011 The callable bond value equals the "optionless" bond value, less the...the value of American option by the maximum value of a series of European options **sampling** the expiry dates in the callable period. We will assume the well-known Hull and...

11/K/3 (Item 2 from file: 349)

Fulltext Availability:
Detailed Description

Detailed Description

... the image pyramid storage forinat;

Fig. 34 illustrates a time line of the process of **sampling** an Artcard;
Fig. 35 illustrates the super **sampling** process;
Fig. ...Fig. 61 illustrates the layout of encoded data within a datablock;
Fig. 62 illustrates the **sampling** process in **sampling** an alternative Artcard; Fig. 63 illustrates, in exaggerated form, an example of **sampling** a rotated alternative Artcard;
Fig. 64 illustrates the scanning process;
Fig. 65 illustrates the likely...to the width of the data array on the Artcard 9. To satisfy Nyquist's **sampling** theorem, the resolution of the linear image sensor 34 must be at least twice the...178, and there are 4 Processing Units in the VL1W Vector Processor 74. The total **number** of buses is therefore 8.) In any given cycle, in addition to a single 32... and Fgen are responsible for ordering the inputs to the Interpolate units so that they **match** the operation being perfon-ned. For example, to perform bilinear interpolation, each of the 4...in Fig. 19.
BoxOf[set: This special purpose register is used to determine a sub-**sampling** in terms of which input pixels will be used as the center of the box...the previous line when we process the next line). So long as input and outputs **match** each other on average, the Output FIFO should always be full. Consequently there is effectively...map. The original image 115 is a 1:1 representation. Low-pass filtering and sub- **sampling** by 2:1 in each dimension produces an image 1/4 the original size 116... for storage in DRAM. The image sensor produces 11,000 8-bit samples per scanline, **sampling** the Artcard at 4800 dpi. The AI is a state machine that sends control information...double the printed resolution to satisfy Nyquist's Theorem. In practice it is better to **sample** at a higher rate than this. Preferably, the pixels are sampled 230 at 3 times... approximately 16,000 columns. Of course if a dot is not exactly aligned with the **sampling** CCD the worst and most likely case is that a dot will be sensed over...a dot covers a 4x4 pixel area. However, thanks to the fact that we are **sampling** at 3 times the resolution of the dot, the number of pixels required to detect...and can be compiled into about 500 gates. The lookup table can be a simple **threshold** table, with the exception that the center pixel (Pixel 1) is weighted more heavily.

SLep...

...actual pixels (from the CCD) are compared with the expected 'perfect' pixels.

If the two **match** , then the actual centroid location must be exactly in the expected position, so the centroid...it is necessary to change the column centroid As if the expected pixels don't **match** the detected pixels. From the bit history, the value of the bits found for the... utilisation of 1600 dpi printing on a 86 mm x 55 mm card as the **sample** Artcard, but it is simple to detennine alternative equivalent layouts and ...double the printed resolution to satisfy Nyquist's Theorem. The term pixel refers to a **sample** value from an alternative Artcard reader device. For example, when 1600 dpi dots are scanned...

...are 3 pixels in each dimension of a dot, or 9 pixels per dot. The **sampling** process will be further explained hereinafter.

Turning to Fig. 48, there is shown the data surface 1 101 a **sample** of alternative Artcard. Each alternative Artcard consists of an "active" region 1102 surrounded by a...most of the alternative Artcard surface we can limit our timing concerns to that region.

Sampling Dots

The dots on an alternative Artcard must be sampled by a CCD reader or...

...double the printed resolution to satisfy Nyquist's Theorem. In practice it is better to **sample** at a higher rate than this. In the alternative Artcard ...pixels at 4800 dpi. Of course if a dot is not exactly aligned

with the **sampling** sensor, the worst and most likely case as illustrated in Fig. 62, is that a...by a CCD pixel is too large, there will be too much blurring and the **sampling** required to recover the data will not be met. Fig. 64 is a schematic illustration...alternative Artcard decoding increases.

Fig. 66 only illustrates the symbol (byte) errors corresponding to the **number** of Reed-Solomon blocks in error.

There is a trade-off between the amount of...function is simple. Pixels from two areas of the scanned column are passed through a **threshold** filter to determine if they are black or white. It is possible to then wait...0
for (i=MAX-PLXEL-BOUND; i>LOWER-REGION@
BOUND; i--)
if (GetPixel(column, i) < **THRESHOLD**)
count = 0 H pixel is black
else
count++ H pixel is white
if (count > WFHTE...segments, each containing 8 data blocks as shown in Fig. 73.

The segments as shown **match** the logical alternative Artcard. Physically, the alternative Artcard is likely to be rotated by some...
betterColumn = pos, + column
FindMax is a function that reconstructs the original 1 dimensional signal based **sample** points and returns the position of the maximum as well as the maximum value found...been located from the phase-locked loop tracking the clockmarks, all that remains is to **sample** the dot column at the center of each dot down that column. The variable CurrentDot... DataDelta (2 additions: 1 for the column ordinate, the other for the pixel ordinate). A **sample** of the dot at the given coordinate (bi-linear interpolation) is taken, and a pixel...

...determine the bit value for that dot. However it is possible to use the pixel **value** in context with the center value for the two surrounding dots on the ...is effectively a multi-resolution pixelmap. The original image is a 1:1 representation. Sub- **sampling** by 2:1 in each dimension produces an image 1/4 the original size. This...warper performs several tasks in order to warp an image.

Scale the warp map to **match** the output image size.

Detennine the span of the region of input image pixels represented... scale the warp map. In most cases the warp map will be scaled up to **match** the size of the photo.

Assuming a warp map that requires 8 or fewer cycles...32 should be available, and preferably 64 or more.

Scaling
Scaliniz is essentially a re- **sampling** of an image. Scale up of an image can be performed using the Affine Transform...so different scale factors can be used in each dimension.

The generalized scale unit must **match** the Affine Transfon-n scale function in terms of registration. The generalized scaling process is as illustrated in Fig. 98. The scale in X is accomplished by Fant's re- **sampling** algorithm as illustrated in Fig. 99.

Where the following constants are set by software.
Constant...Fig. 100 and is also accomplished by a slightly altered version of Fant's re- **sampling** algorithm to account for processing in order of X pixels.

Where the following constants are...in order to transform it into a

useful forin for processing.

Up-interpolation of low- **sample** rate color components in CCD image (interpreting correct orientation of pixels)
Color conversion from RGB...scheme. The transformations are therefore broken into two phases.

Phase 1: Up-interpolation of low- **sample** rate color components in CCD image (interpreting correct orientation of pixels)
Color conversion from RGB...that may not be a simple 1:2 expansion.

Phase 1: Up-interpolation of low- **sample** rate color components.

Each of the 3 color components (R, G, and B) needs to...

11/K/4 (Item 3 from file: 349)

Fulltext Availability:
Detailed Description

Detailed Description
... with significant brand equity or symbolic value, where the cost of production is below the **market value** .

In the commercial manufacturing world, it is not uncornmon for counterfeit or otherw(inverted exclamation...More particularly, in traditional digital halfLoning, turning on an appropriate number of bits in a **threshold** array generates the desired tone. The array holds a sequence of **threshold** values that may spiral outward from. a central location as the **threshold** values ascend. Bits corresponding to those locations in the halfione cell `tum on` if the...

...value for that bit location. This method generates halftone dots that grow asymmetrically, as one **threshold** afier anolher is traversed through a range of intensit-y values from, say, 0 to...be possible to use the traditional thresholding array to generate serpentines given a large enough **threshold** array.
There are two main goals when analytically defining the shape function. The first is...to compare the acquired moire intensity profile with a prestored reference image. Depending on the **match** , the document handling device connected to the comparing processor accepts or rejects the document. An...of the object and mark-ings, more than one record may be retrieved for possible **matching** with the unauthenticated object. In this case, the inforination in the database records should unambiguously ...December 16, 1986), incorporated herein by reference, provides an electronic transaction verification system that employs **random number** values to encode tTansaction data.

U.S. Pat. No. 4.463,250 (McNeight, et al...Further, even when self-authentication (inverted exclamation mark)s employed, at least a random statistical **sampling** of the documents being authenticated are authenticated using higher scrutiny, thereby increasing file probability of...and authentication of the originator of the message.

Likemase, other tecliniques may be employed lo **match** the content destined for a particular recording medium with that medium. For example, a graphic...predetermined spectrographic characteristics are employed, which are detected using a spectrographic (narrowband) optical scanner to **match** a predetermined spectral characteristic with an observed spectral characteristic for authentication. Thus, a single scanner...

...a decision, as well as an associated statistical reliability. Further,

one embodiment provides an adaptive **threshold** , based, for example, on the circumstances of presentment, value of the docurnent, noise or interfering...

11/K/5 (Item 4 from file: 349)
DIALOG(R)File 349:(c) 2005 WIPO/Univentio. All rts. reserv.

Fulltext Availability:
Detailed Description
Claims

English Abstract
...objects. Applications of the systems may be in the field of retail, wholesale, entitlement, gifting, **auction** , barter, gaming, investment, security and other commercial and non-commercial activities.

Detailed Description
... authenticating token(s) signifying an entity/entities owning or having a right to control said **bid** pool(s) and/or said gaming/gambling pool(s).

4 2.3 [Claims 185-204...may comprise: a child account(s), a peer account(s), an escrow account(s), a **bid** account(s), a gaming account(s), and a proxy account(s). An escrow account(s...destroying, evaluating, generating, implementing, maintaining, modifying, processing, registering, and/or otherwise manipulating one or more **bid** pools, and/or one or more gaming/gambling pools. In certain forras of these embodiments...
...token(s) signifying an entity/entities owning or having a right to control, respectively, said **bid** pool(s), and/or said gaming/gambling POOI(S).

2o 4 4.21 [Claims 614...purchase of goods, services, or other cash and non-cash assets. In other embodiments, virtual **bid** accounts are provided through which parties can securely, yet anonymously, transfer assets between and amongst parties for setting, evaluation of, and payment of **bids** , for the purchase of goods, services, or other cash and non-cash assets, most typically...as provided by several embodiments, include the ability to coordinate value-added services including escrow, **bid** and gaining/gambling transactions between two or more parties. Virtual clearinghouses can also render tax...virtual clearinghouse (referred hereafter as 4 Gclearinghouse"), used to facilitate virtual account transactions, escrow transactions, **bid** pools, gaming/gainbling pools, and containing tax & fee, digital signature, digital certificate, credential & license, and...Figure 172 shows an example of a primary account domain containing a
1 5 representative **sample** of the most common types of subordinate accounts, including.

child, peer, escrow, escrow obligation, escrow credit, **bid** , gaming, proxy, dynamic proxy, proxy with dynamic VINs, and. labeled subordinate accounts, and a subordinate...

...Figure 181 shows an example of a primary account domain showing the creation of a **bid** account and related **bid** pool via the inheritance of the primary accounfs **bid** account constraint set skeleton.

Figure 182 shows an example of the creation of a **bid** /request account with multiple **bid** /request child accounts and **bid** pools.

Figure 183 shows an example of the flow of assets, constraints, and agents, alerts, and triggers, in the creation and operation of a **bid** account established to facilitate a **bid** between competing **bidders** .

Figure 184 shows an example of the automatic establishment and operation

of a **bid** escrow account within. a **bid** pool.

Figure 185 shows an example of a primary account domain showing the creation of...The six subsystems shown are typical of a labeling system configuration.

Figure 251 shows three **sample** hardware specifications for typical configurations of a repository computer system identify(inverted exclamation mark)ng a small, large, and high availability configuration.

Figure 252 shows three **sample** hardware specifications for tyPical.

configurations of a clearinghouse computer system identifying a small, large, and.

high availability configuration.

Figure 253 shows three **sample** hardware specifications for tyPical configurations of a naming system computer system identifying a small, large, and high availability configuration.

Figure 254 shows three **sample** hardware specifications for typical configurations of a labeling system computer system identifying a small, large...features allow for the creation of other specific use accounts, for example escrow accounts and **bid** accounts facilitating person-to-person commerce.

1 5 In specific forms of certain embodiments of...classes of subordinate aceounts that can be generated.
1) Child
2) Peer
3) Escrow
4) **Bid**
103
) Gaming
6) Proxy
Additional fom-is of these embodiments allow for the creation of... escrow/credit account from the designated source(s) for disbursement as required.

7 9.4 **Bid** Accounts
Another class of subordinate accounts found in several embodiments are **bid** accounts, of which there are two major sub-classes, "requesf' accounts and "offer" accounts. Request accounts are accounts used by those requesting that other participants **bid** for the right to take part in a transaction devised by the requesting party; offer accounts are for entities who wish to compete for the right to participate in a **bid** transaction that is being requested.

Bid accounts, and their associated **bid** pools, facilitate situations in which multiple parties are vying for the right to take part in a transaction. **Bid** accounts are usually created with a fixed duration life span, during which the **bid** account and its associated agents, alerts, and triggers, can in certain embodiments provide innovative services to a prospective **bidder** based on constraints invoked. when the account was created. Some of the standard constraints include: current **bid** price, maximum allowed. **bid** price, **bid** price increase/decrease increment, and **bid** account life span.

3o Thus, in preferred embodiments, a person using a **bid** account to make a **bid** at an **auction** site would have the advantage that his **bid** could be automatically increased, within allowable preset limits, an advantage not provided by standard credit cards or other line of credit aecounts. Additionally, the **bid** account could be set such that (inverted exclamation mark)t causes messages to be sent to the account owner advising the owner of the value of the currently winning **bid** , and

asking for permission to raise or lower a **bid** . **Bid** accounts can be secured by dynamically created escrows or obligafions than insure that a **bidder** (s) is/are sincerely intending to settle the offer placed if their **bid** (s) is/are deemed a winner.

Bid aecounts work in conjunction with a **bid** pool. A request account establishes the constraints required for transactions in which multiple parties will...

...a few standard constraints at the time of creation which help to define prospective future **bids** . Examples include: **bid** entry deadline, **bid** start and end dates and times, updated or sealed current **bid** results, minimum **bid** , mininiura required change (increase or decrease) over previous winning **bid** , seller's PIN, and transaction conditions (e.g., delivery date, product specifications, and retum policY...

...the publication request, the A-AMS or an associated virtual clearinghouse system (VCHS) creates the **bid** pool. The **bid** pool coordinates all responses that meet the criteria established for the request account.

2o Additionally, the **bid** pool manages the creation of alerts, agents, and triggers, coordinated with the constraint set of the **bid** creator and the various **bidders** . Thus the request creator can determine if there will be open **bidding** (in which the current maximum/ininirnum **bid** is publicly available), sealed **bids** (where no **bidder** 's infonnation is available), a **bid** in which **bidders** are allowed to solicit changes to the constraints, or **bids** which can be automatically or inanually adjusted dependent upon the level of negotiation set forth in the constraint set.

Intemal to the **bid** pool, **bids** received can be ordered and organized according to various criteria, most typically high-to-low **bid** , or first-come, first-served (FCFS).

If desired, **bids** can be created for multiple items, wherein the **bid** pool serves to **match** several **bidders** to several items. It is also possible to create enibodiments in which the type of asset(s) offered to pay for the **bid** can be a determining factor in the acceptance of the **bid** . With this facility, barter transactions can also be conducted.

112
Bid pools can also be created to allow for multi-party **bids** (e.g., some value frombidder one, plus some value from **bidder** two, three, etc.) and with items then parceled out to the group of w(inverted exclamation mark)m-ung **bidders** either in equal shares, or by percentage of their **bid** .

Most **bid** pools will also typically create an intemal escrow account, owned by the **bid** pool, which secures the assets used or offered by the winning **bidder** (s), or by the currently selected winning b(inverted exclamation mark)dder(s). Thus, a **bid** pool can be used to automatically guarantee that the required winning assets are available before determining that a winning **bid** has been made. If over the life-span of the **bid** / **bid** 1 0 pool, a win-ning **bidder** is displaced by a superior **bid** , the former escrow account is dissolved and a new escrow is created. Optionally, **bid** pools can be set up such that they create and dissolve multiple escrow accounts for both the current lead **bidder** , and any other selected **bidders** (such as a second runner up, in cases where the lead **bidder** cancels their **bid**).

Request accounts can also be set in hierarchical fashion such they manage a
wide range of **bids** focused on some common elements. An example of such a
hierarchical arrangement is the items for **bid** at an estate sale.

Typically, estate sales are constructed with the goal of disposing (selling) every item. However, circumstances can arise wherein a prospective **bidder** only wishes to **bid** on a portion of a set of items, e.g., just one dining room chair...

...a request hierarchy can be established such that the top level request aecount (and its **matching** **bid** pool) is created for the table-chairs as a group, with two child request accounts...

...this last level containing four accounts, one request account per chair. In this way, prospective **bidders** can **bid** on a part or on the entirety of the items, and the estate sale holder can thus determine the maximurn gain possible for the totality of the items up for **bid** .

The occasion may arise where competition for selected pieces raises the prices to be paid...

...in which case, the request hierarchy creator would have the ability to selectively determine winning **bidders** , or couId automate the process through the use of constraints, agents, alerts, and triggers.

In a related fashion, offer accounts can be chained together such that a **bidder** may
113
place multiple **bids** on each of the discrete items, and on the set, using agents, alerts, and triggers to raise, lower, or even create **bids** based on the status of **bids** revealed.

7 9.5 Gaming Accounts
In certain embodiments, the AAMS offers a predefined class... championship, with levels in the hierarchy for quarter-finals, semi-finals, and finals, with cach **match** placed at its appropriate level in the hierarchy. In another example, consider the spin of...

...a gaming pool. The gaming pool manages the placing of individual bets, and can also **match** bets on either side of a wager through the creation of alerts, agents, and triggers...

...account, most conuno the 1 0 requesting account. Dynamic tokens set a new and reduced **threshold** of risk associated with. the loss or misappropriation of an account number by creating a...are, or were, synchronized, the host system and access device sho-ald create identical tokens.

Matching randomly generated authenticating tokens will be accepted by the host system as sufficient identification and...

...then none of the individual transaction histories 1 5 recorded by the corporatio'ns will **match** , and the account owner's privacy will be secure.
7.5 Account Modifications
Aecounts and...

...sub-accounts are classified as general accounts or a specific specialized form such as a **bid** , gamblingIgaming, escrow, or proxy account.

Subject to any existing constraints, virtual accounts and. sub-accounts ...structures necessary to facilitate the automation of business models for barter, haggIe, fixed price sales, **auction** sales (including both English and Dutch style), reverse auctions, demand aggregation, and exchanges.

Additionally, repositories...

...in the capacity of a market maker, gambling/gaming house account, retail

sales catalog, and **auction** posting board.

As a market maker, the system may be required to maintain an inventory... add value by providing specialized coordination services including: escrow account creation and escrow transaction management; **bid** pool creation, and **bid** transaction management; gaming/gambling pool creation, and gaming/ganibling transaction managernent; agent services, including acting...

...transaction. As an example, consider the case of a clearinghouse that creates and manages a **bid** pool, which organizes, sorts, and Matches buyers lo sellers. In this instance, the individual **bidders** couId not complete theit transactions without the clearinghouse **bid** pool. Additionally, clearinghouses afford the opportunity for multirepository transactions for these various special services, especially...

...be escrowed. Thus, an escrow may be established to guarantee: payment for purchases, contractual obligations, **bids** , gaming/gainbling, or taxes or fees. The criteria for release of escrow fands conditions the...

...example ruight: be a person-toperson commerce transaction for a purchase made on an Intemet **auction** site that
134
automatically ...subsequent to a delivery notification by a shipper such as UPS or FedEx.

7 3 **Bid** Services
Another embodiment of clearinghouses provides coordinated **bid** services. **Bid** transactions include any instance in which multiple parties compete for the right to enter into or complete a transaction. **Bidders** can include buyers or sellers (e.g., auctions or reverse auctions), respondents to requests for proposals (RFPs) or requests for quotations (RFQs), among others. A **bid** transaction holds a conditional obligation to pay based upon successful transaction sefflement. Each **bid** may optionally be 1 o guaranteed by an escrow account. The clearinghouse holds **bids** until settlement and resolves winning and losing **bids** .

In other enibodiments, **bids** are grouped together for simplified management using **bid** pools. **Bid** pools are used for multiple purposes depending on the type of transaction. For **auction** -like transactions where there is a one-to-many relationship, **bid** pools are used to keep track of each successive winning **bid** and maintain a hierarchical list of surpassed **bids** . Thus, should a winning **bidder** fail to complete the transaction, the offeror would have the option to contact the remaining **bidders** , in order, and try to complete their transaction.

For many-to-many transactions, **bid** pools can organize, sort, and determine **matching** **bids** between offerors and **bidders** . For Dutch auctions and demand aggregation buying situations, the **bid** pool can determine how many of each object: a **bidder** may be able to obtain, and, based on criteria supplied by the offerors, the price per unit **bid** .

7 4 Gaming Services
In still another embodiment, the clearinghouse provides coordinated gamingIgambling services. A...

...clearinghouse holds gaming/gambling transactions until settlement and resolves winning and losing wagers.

135
Lke **bid** pools, clearinghouses also offer gaining/gambling pools. Using a
gaming/gambling pool, wagers and associated...

...wager, and. takes a cut of the transactions, with the gaming/gambling pool used to **match** wagerers taking one side or the other. In such

instances, the pool can also perform one-to-many, and many-to-many matches, if the amounts wagered do not **match** on a one-to-one level.

7 5 Agent Services
1 0 In certain embodiments...services that clearinghouses can provide, specific objects within or managed by a clearinghouse, such as **bid** pools or tax escrow accounts, can be encrypted separately, in addition to the general encryption...ETND). Like an ETND a label 1 o can be searched, returning a list of **matching** names, aliases, accounts, and/or other (inverted exclamation mark)dentifying information such as addresses. In ...either a VIN, an alias, a descriptive attribute, or other token, returning a set of **matching** results. Search results could contain additional infonnation such as the name and routing address of...

...dynan-lically generated using a nonrandom mathematical function(s) or computerized algorithm(s). Alternately, a **random number** generator can be used as an integral part of the label generation mathematical function(s) or computerized algorithm(s). The **random number**
144
generator may be based upon a pseudo- **random number** generator, tied to a time clock, or supported by internal or external computer devices.

System...certain functional parameters, as if cafeteria manager was allowing them to determine the mix and **match** of portions and items within li-tnits.

The most advanced systems of this invention offer...system, with a narning system or with another clearinghouse; or the occurrence of transactional activity, **bid** or **bid** pool activity, or wager or gambling/gaming pool activity.

A VNS alert typically would be...or near real-time alerts. Channel broadcasts are ofien used to monitor market conditions using **sampling** techniques or to watch for changes in status of specific devices such as ATMs (e...

...for clearinghouses. These can respond to clearinghouse alerts such as the evaluation of escrow conditions, **bid** pool activity, or gambling/gaming pool activity. Clearinghouse triggers can also respond to timers that...

...or clock-driven events. Clearinghouse triggers can cause the transfer of funds from a winning **bidder** 's aecount to an escrow aecount at the close of an **auction** .

Triggers can exist for label systems. These can respond to label system alerts such as...

...transaction activity, lack of transaction activity, or external messages. Some triggers monitor strewning alerts for **threshold** conditions that are based upon formulas or other mathematical equations. Clock events can cause a...not limited to seeking out the best prices from multiple sellers, automating participation in an **auction** , automating the purchasing or selling of securities, negotiating the terms and conditions of contracts, bartering...exchange rates, by making the exchange
personally through their virtual aecounts
8 3.2 Auctions
Auction transactions are used in seller-dominated marketplaces to pit buyers against each. other to discover...

...highesi price. There are multiple forms of auctions.

One familiar type is the ascending (English) **auction** where the buyers compete by **bidding** the sales price higher. Another type of **auction** is

the descending (Dutch) **auction** where the price decreases over time, but limited quantifies are available so buyers wait, for...

...for the sale of perishable goods where complete sale of all inventory is highly desirable.
Auction transactions can be executed using virtual azcounts to exchange assets and complete a purchase between a buyer and seller. A virtual aecount: **auction** transaction allows the buyer to conduct the purchase transaction and then consummate the deal. The...

...in a marketplace of vendors (sellers) who advertise their goods and then enter into specific **auction** **bid** transactions with individual buyers. **Bidders** may be required to escrow or obligate fimds until it is detennined whether they have a winn(inverted exclamation mark)ng **bid** . Optionally, the winning **bidders** (buyers) and seller may agree to use an escrow account to coordinate the appropriate settlement...

...managed by either the buyer or the seller, or by a third party escrow service.

Auction transactions using virtual accounts may take many forms, including these examples.

lo Seller offers three identical new stereo systems at **auction** with a minimum reserve price of five hundred US dollars; buyers compete for the right to purchase a specific quantity of the stereo systems at a **bid** price plus applicable taxes and shipping costs; the **bidders** compete by placing increasing **bids** for the limited quantity of stereos; the winning **bidders** (buyers), if the winning **bid** is above the reserve price, complete the purchase and the payment is made by transfer...

...a parcel of real estate with a starting price of thirty thousand US dollars accepting **bids** in increments of five hundred dollars; buyers compete for the right to purchase the property at the **bid** price plus applicable taxes and govemment fees; the winning **bidder** (buyer) completes the purchase and the parties agree on an exchange with proper disposition of...

...thousand New Zealand dollars as a single item, for which the buyers compete by placing **bids** using an escrowed **bid** process; the winning **bidder** (buyer) and seller agree to coordinate the delivery of the animals subject to a clean...

...video from. the Beatles as a single item; potential buyers examine the goods and place **bids** ; the assets are transferred immediately between the winning b(inverted exclamation mark)dder's and...

...accounts Seller offers four transferable season passes to Disney World with two months remaining, accepting **bids** only in frequent fiyer miles with a minimum reserve of tweIve thousand United frequent fiyer miles; the **bidders** compete by placing increasing **bids** ; the winning **bidder** , provided the **bid** was above the reserve price,completes the purchase and the assets are transferred between the...

...sedans with full- dealer warranty for twenty thousand US dollars each, using a Dutch-style **auction** ; buyers submit **bids** for the vehicles as the price falls over time; the **auction** ends when all of the vehicles are sold; cach winning bidder (buyer) pays the seller...

Claim
... said. clearinghouse system to act as a third party intermediary for facilitating one or more **bid** transactions. 180. A virtual clearinghouse system according to claim. 172 comprising data and/or code...

...destroying, evaluating, generating, iraplementing, maintaining, modifying, processing, registering, and/or otherwise

manipulating one or more **bid** pools. 181. A virtual clearingho-use system according to claim. 180 in which said at...

...create, deactivate, destroy, evaluate, generate, implement, maintain, modify, process, register, and/or otherwise manipulate a **bid** pool(s) only if said conunand(s) is/are received in conjunction. with a PIN entity/entities owning or having a right to control said **bid** pool(s). 182. A virtual clearinghouse system according to claim 172 in which said system...first and second sub-accounts are selected from the group consisting of child, peer, escrow, **bid** , gaming and proxy accounts. 600. An advanced asset management system according to claim 596 in...

...596 in which said 1 0 one or more classes of sub-accounts comprise a **bid** account(s). 1 1 604. An advanced asset management system according to claim 596 in...

...destroying, evaluating, generating,
implementing, maintaining, modifying, processing, registering, and/or otherwise manipulating one or more **bid** pools.
351
611. An advanced asset management system according to claim. 610 in which said...

...create, deactivate, destroy, evaluate, generate,
implement, maintain, modify, process, register, and/or otherwise manipulate a **bid** pool(s) offly if said command(s) is/are received in conjunction with a
PIN...

...authenticating token(s) signifying an
entity/entities owning or having a right to control said **bid** pool(s). 612. An advanced asset management system aceording to claim 1 comprising data
and...system to act as a third party intennediary for facilitating one or 1 0 more **bid** transactions. 1 1 713. A method according to claim 7 1 0 comprising data and...
...destroying, evaluating, generating, implementing, maintaining, modifying, processing, registering, and/or otherwise manipulating one or more **bid** pools. 714. A method according to claira 71 0 comprising data and/or code cause...

11/K/6 (Item 5 from file: 349)

Fulltext Availability:
Detailed Description
Claims

Detailed Description
... in question. This is true in part, for instance, because the customer cannot necessarily handle, **sample** , or evaluate at first hand the goods or services in question in an online transaction...equivalence in equity prices.

According to another embodiment of the present invention, a method for **bidirectionally** exchanging value-added information between parties is provided. The method includes the steps of (1...2) receiving a request for the 1 5 information data from a second party; (3) **matching** the predetermined rule with the request; and (4) uniquely identifying the information data and the...known systems. With the present invention, goods and services are better able to realize full **market value** because access to the good or service is not restricted (such as with new music...of these "same" goods.

Value-adding components may also include an offer, an acceptance, a **bid**

, a purchase, and a sale of a securities instrument, including an option, a warrant, or...

...liability, or may consider the time value of money when determining a limit of liability **threshold** . The present invention may enable rules/access/authorization based on the result of that operation... verification of parties or real time association of parties with information being transacted (in an **auction** , for instance). They are also not representative of a cryptographic key, which, as is wellknown... and protecting informational signals, or data, or digital watermarks (predetermined messages) in a given digitized **sample** stream (e.g., a predetermined carrier signal, such as audio, video, image, multimedia, virtual 0...benefits described herein, personal information or privacy data may be controlled by the user in **sample** embodiments envisioned, unlike other pre-determinations of data in nontrusted transaction smart cards (e.g...systems are valuable contemplated with the present invention.

Valuations of trust also enables the described **sample** embodiment of a trusted transaction system or device to compare private information with financial information...in step 408, the content is stored in the LCS. If the hash does not **match** , the content is rejected.
Referring again to Fig. 2, LCS domain 204 may export content...608, the content is stored in LCS domain at High Quality. If it does not **match** , in step 614, the content is rejected.

Referring again to Fig. 2, path 228 connects...

...step 708, the content is stored in the LCS domain. If the hash does not **match** , in step 712, the content is rejected.

Referring again to Fig. 2, path 230 connects...a secure transmission channel. Number generator 1008 may be provided. Number generator may be a **random number** generator, or it may be a pseudo- **random number** generator.

In addition, the device may include a controller, a power source, and an input...entire value-added component, encoded in the least significant bit (LSB) of each 16-bit **sample** . This gives a data rate of 88200 bits per second in a stereo CD file...a block of samples.

(2) A hash of the value-added component block and a **random number** seeded by the owner's identity (Device or system Unique ID) is generated and encoded...

...block of samples.

(3) A hash of the first two blocks of samples and a **random number** seeded by the owner's identity is generated and encoded into a third block of...

...type of block
long BlockLength; HThe length of the block
HBlock data of a length **matching**
BlockLength
char IdentityHash[hashSize];
char InsertionHash[hashSize];
An application can read the block identifier and...

...embodiments). A transaction ID may be embedded at the time of purchase with a hash **matching** the symmetric key (or key pair). The watermark may then be embedded using a very...

Claim
... from a first party;

receiving a request for the information data from a second party;
matching the rule with the request; and
uniquely identifying the information data and the first...the
steganographic cipher
comprises:
a number generator selected from the group consisting of a pseudo- **random**

number generator and a **random** **number** generator;
a predetermined key generation algorithm selected from the group
consisting
of a...

11/K/7 (Item 6 from file: 349)

Fulltext Availability:
Detailed Description
Claims

Detailed Description
... John, John miner, and Richard Palmer (1993).

"Behavior of Trading Automata in a computerized Double
Auction Market", in The Double **Auction** Market). For example,
Glosten-Milgrom (GM) model examines the relationship between
Dealer spreads and the...for a market with a mixed population
of dealers.

FIG. 6 shows graphs of RMS(**bid** - True value) and
RMS(ask - True Value) as a function of the tick size...highest level
algorithm can tune the rate of search in the space of models
to **match** the non-stationarity of the market itself such that
the search procedure persistently finds good...of the invention shown in
FIG. 1. A set of past time series and **matching** statistics
forms an exemplary economic model 105. This process begins,
without limitation, with a time...of the state space,
the stochastic process chooses at random, a mock future price
matching the statistics of the future from this new point in
the past in the state...

...120 "past-future" state space maps can be compared via
the "Future - Future" tensor **matching** procedure to find,
estimate and modify the initial "past - now - future" state
space to achieve...to obtain
an ensemble of such time series. This ensemble may be
regarded as a **sample** from an underlying probability
distribution for the whole stochastic process (the causal
model) that...

...RULE 26)
inside the spread, making a quick profit. In the context of
double-oral **auction** markets, such strategies were observed to
be highly effective, outperforming all others as indicated in...

...John, John Miner, and Richard Palmer (1993): "Behavior
of Trading Automata in a computerized Double **Auction** Market",
The Double **Auction** Market: ...RULE 26)
which markets mediate). Dealers are obliged at every moment
to post their current **bid** and ask prices, and their volumes,
on the public board. Investors decide whether they consider...

...able to
take his next action. An action for a dealer is to choose his
bid and ask price, and for an investor is to buy or sell at
the best...

...of all trading, have much more latitude in their strategies. Dealers must set both **bid** and offer prices and volumes. Investors must decide only on the course of action at...is above or below of the "true" value. From that data the dealer decides what **bids** and asks to quote. For this particular type of dealer it is also very easy...

...The simplest version of this dealer reacts bv increasing the ask price above the current **market price** . If the converse holds (there were more sells in the past), the dealer reacts by lowering his **bid** price. A slightly more sophisticated version of this dealer adjusts both **bid** and ask as a reaction to is excess demand or excess supply (there is a...

...RULE 26)
discovery as explained in Friedman, Daniel, and John Rust, eds. (1993): The Double **Auction** Market.

Institutions, Theories and Evidence, Reading, Massachussetts: Addison-Wesley. On at least one major exchange...

...performs quite well in most of the markets we have experimented with.

0 A " **Matching** " dealer who contains a collection of observations and actions. He learns connections between observations and...

...are profitable. Examples of observations are: "my inventory is high", "the spread is large", "my **bid** is below the market", "my inventory is near zero". "trade volume is high". Examples of actions are more obvious: "raise my quotes", "increase my **bid** ", "narrow my spread".

A "Classifier" dealer is similar to the **Matching** dealer, except he learns over patterns of observations. For instance, instead of just **matching** one of the aforementioned observations. The classifier dealer might
- 36
SUBSTITUTE SHEET (RULE 26)
learn...

...to learn in.

A "Dynamical System" dealer uses a discrete dynamical system to set his **bid** -ask spread and mean price. If one regards mean price, P. as a source or a sink of inventory, I , and the **bid** -ask spread, S, as a source or a sink of cash flow, C, then generically this form: the " **Matching** Dealer" and the "Classifier Dealer." These are significantly more sophisticated types of strategies: the...

...the connections between observables (quote changes, trade volume, inventory level ....) and useful responses (changes to **bid** and offer) in the market.

our results indicate that the choice of strategy building blocks...

...sophisticated strategy is by no means certain

to be more successful. For instance, the Double **Auction** Market explained in Rust, John, John Miner, and Richard Palmer (1993): "Behavior of Trading Automata in a computerized Double **Auction** Market" found that the simplest parasitic strategy was the most effective. Furthermore, as suggested by...

...Dealers for different tick sizes. Visually, we can see that the three curves plotted (best **bid** , best offer, and true value) are closer together at a larger tick size, although the...

...and market structures. In particular we have examined data on the statistical distribution of (best **bid** - true value)2, (best offer - true value)', average value of the spread and standard deviation...

...cases. we will define market tracking as consisting of two different components.

1) The market **bid** and ask prices are close to the true value, and
2) The true value is inside the market **bid** and ask.

As one can see, these two conditions do differ: it is possible for...

...reacts very slowly to the true price although the true price stays inside the **bid** -ask spread, essentiallv because the spread size is large. Obviously, some regimes of tracking the...

...to track prices by four different parameters.

1) the square root of the average squared (**bid** - True Value). We will denote it RMS(**bid** -True Value) where RMS means Root-Mean-Square.

2) the square root of the average...

...gives us a very good idea of market performance.

FIG. 6 shows graphs of RMS(**bid** - True Value) and RMS(ask - True Value) as a function of the tick size...reason for this is clear: when most investors are uninformed, no matter where the market **bid** and offer are located, roughly

equal numbers of investors will...

...John, John Miner, and Richard Palmer (1993): "Behavior of Trading Automata in a computerized Double **Auction** Market", in The Double **Auction** Market). A less obvious observation, however, is that parasites can produce useful information just...and trades as they occur on the right The quote montage contains each dealer's **bid** and each dealer's offer, ranked vertically from best to worst (so the largest **bid** and smallest offer are at the top of the montage).

Dealers are identified by...

...the best offer at each time-step, a trace in yel low of the best **bid** at each time-step, and asterisks in green

of the trades that occur. Since, within each individual time-step, the available best **bid** /offer may change as trades

come in, not all of the trades plotted will lie directly on either the **bid** or the offer traces.

There are five other parts to the main window: the current...

...thus join in the simulation. By clicking with the mouse, the user can adjust either **bid** , offer, or both up or down by a single tick.

Clicking multiple times will adjust main trade/ **bid** /offer display, the simulation allows the user to graph a number of other observables. There...

...price discovery in action, it is best to display the underlying value in the **bid** /offer/trade graph to the right of the main control panel. To do this, go...inventory holdings are output to file at each time-step
0 OutputValueDebugData: if true, best **bid** , best offer, and true value are output whenever a trade takes place.

OutputObjectFilesRate: rate at...

...assets are output to file at each time-step
OutputBids: if true, each dealer's **bid** is output to file at each time-step
OutputOffers: if true, each dealer's offer...

...would allow obvious arbitrage opportunities
RandomWalkSeed: can be used to fix the seed for the **random number** generator used by the random walk
TickSize: sets the initial tick size.
The "dealerMix" file...

...A time-step method, which runs the simulation forward one step in time.

Methods for **matching** Investors who wish to buy or sell the security with the Dealers who are trading the security at the Investors' desired price.

A Quote Montage object, which displays the current **bid** and ask prices and volumes of all Dealers in the market. It also provides a method for displaying the current best **bid** and ask and their volumes.

A Scheduler object. The scheduler determines the order and frequency...

...to buy or sell the security,

while Dealers decide what **bids** and asks to post on the Market's Quote Montage.

GuiMarket: The GuiMarket provides the...

...about the time and spread. It also displays all the dealers, the volume, and the **bid** price on the left side, and the dealers, volume,

and price offered on the right side.

Display of Buy/Sell graph as trades occur. The volume of stock for current **bid** prices is graphed against the volume of stock at the current offer price.

Buttons...Practical risk measures that we use include the probability of loss greater than a specified **threshold** , the expected worst drawdown in a given period, the expected time between significant drawdowns...of shares held rather than simply inclusion or exclusion. To each portfolio, assign a **random number** of stocks to hold such that every possible portfolio size is covered (at least one...

...portfolio. If a bit is different, the less successful portfolio changes its bit to **match** the more successful portfolio). The portfolio with the lower value at risk remains unchanged.

Step 4.

Repeat steps 2 and 3 until some **threshold** for value at risk is achieved.

In this way, clusters of anti-correlated...uncertainties inaccurate. The present invention uses techniques borrowed from non-standard statistics (large deviation theory, **sampling** theory) and quantum field theory (path integrals) to generate a forward curve of the...

...curve.

Evaluating and Minimizing Risk
The present invention includes additional techniques for portfolio optimization using **sampling** and selection to evaluate and minimize risk for a portfolio of assets with uncertain...n << 1V. Starting from the original portfolio randomly form portfolios of half the size by **sampling** stocks (without replacement) from the entire portfolio. The probability that any one of these randomly...

...fact that n must lie between AT/22and N12m. At this point we can then **sample** from the portfolio of size N/2'to form new portfolios of size (N12m + N12...

...built to optimize these algorithm parameters.

Another important extension is to realize that the **sample** and select method outlined above can be used to determine subsets with any desired properties...

...which is hopefully good on all objectives.

There are also a host of issues involving **sampling** to form the new portfolios. In the above I have assumed that the **sampling** is uniform. Of course this need not be the case. The distribution can be altered...tested and the results will be discussed below.

In order to test the algorithm, a **random number** generator was used to create a "toy" set of stock data in which all...

...smaller histogram of hollow circles shows the VaRs only for those portfolios which, through random **sampling** , failed to include any of the good clusters. The mean for the no stocks-in...the first 32 series. Applying the method described we identified all the clusters in the **sample** of 32 as well as in the **sample** of 100 series. corresponding families are listed in FIG. 27, FIG. 28a and FIG. 28b...

Claim
... 26)
. A system as in claim 27.wherein said plurality of dealer agents set a **bid** price, **bid** volume, offer price and offer volume of a security.

29 A system as in claim...

...38 A system as in claim 27 wherein said plurality of dealer strategies comprise a **matching** dealer strategy, said **matching** dealer strategy learns connections between one ore more observations and one or more actions...

...observations comprises one or more of the group consisting of inventory level, spread size, **bid** price relative to **market value** and trade volume.

40 A system as in claim 38 wherein said actions comprises one or more of the group consisting of raising a price, increasing a **bid** and narrowing the spread. - 94
SUBSTITUTE SHEET (RULE 26)
. A system as in claim 27...

...system dealer, said dynamical system dealer uses a discrete dynamical system to set its **bid** price, ask price and mean price.

43 A system as in claim 27 wherein said...

...members of the group consisting of the root mean square of the difference between a **bid** price and a time value, a root mean square of the difference between an...in claim 49 wherein said generating at least one next portfolio comprises the steps of:
sampling said assets from said at least one current portfolio to form a plurality of candidate...

...one or more desired properties.

53 A method as in claim 50 wherein said **sampling** of said assets has a uniform distribution.
54 A method as in claim 50 wherein said **sampling** of said assets has a distribution that varies with time.

55 A method as in claim 54 wherein said **sampling** step further comprises the steps of:
altering said distribution over time based on said one...STOCK MARKET gm DEALER CASH
FILE OPTIONS1 GRAPHS HELP
TIME SET HUMAN DEALER PRICES BEST **BIDS** /BEST OFFERS ALL DEALER Ck
Quo SIT TICK SIZE
VSHOW TRUE VALUE 56 TRADE HISTORY...

...TRAD
100 40 11/16 [LDHJ 100 58 5/16 ES CASH BAR GRAPH
- BEST **BIDS**

-MARK OBSERVABLES TRUE VALUE CASH BAR GRAPH
SPREAD: 4
VOLUME: 3.0 NOT I ME...

...j
20 - [T6 00
-8000
/33
75 70 65 60 55 50 45
Ask
40 - **Bid**
True Value
35
0 5000 10000 15000 20000 25000
Trade
TICK SIZE 1/100
F1Go3A
75 70 65 60 55 50
45 - Ask
Bid
11
40 - True Value
35 1 1
0 5000 10000 15000 20000 25000
Trade
TICK...

...TICK SIZE 1/4
F1G*3C
80 75 70 65 60 5550 45
40 - Ask
Bid
35- True Value
30 1 1 1 1 1
0 5000 10000 15000 20000 25000...

...F1G*3D
SUBSTITUTE SHEET (RULE 26)
/33
75 70 65 60 55 50
45 - Ask
Bid
1
40 - True Value
35 1
0 5060 10060 15060 20000 25000
Trade
TICK SIZE 1/100
F1G*4A
75 70 65
60
55 50
45 - Ask
40 - **Bid**
11
True Value
35
0 2000 4000 6000 8000 10000 12000 140100 16000 18000 20000...

...SIZE 1/4
F1G*4C
80 75 70 65 60 $ 55 50 45
40 - Ask
Bid
35 - True Value
30 I I I I I

0 5000 10000 15000 20000 25000...

...F1Go4D
SUBSTITUTE SHEET (RULE 26)
/33
75 70 65
60
55 50 45
Ask
40 - **Bid**
I
True Value
35 I i I I I I I - I
0 2000 4000...

...Trade
TICK SIZE 1/100
F1Go5A
75 70 65
60-@
55 50 45
40 - Ask
Bid
True Value
35
0 5000 10000 15000 20000 25000
Trade
TICK SIZE 1/16
F1G*5B
SUBSTITUTE SHEET (RULE 26)
/33
75 70 65 60 55 50 45
Ask
Bid
40 - True Value
35 -, I
0 5060 10600 156oo 20000 25600
Trade
TICK SIZE 1...

...15000 20000 250'00
Trade
TICK SIZE $1
F1Go5D
SUBSTITUTE SHEET (RULE 26)
/33
RMS (**Bid** - True Value) and
RMS(Ask - True Value)
12
Mixed Market,
Bids
10 Mixed Market,
Asks
8- 1@1 7 Basic, 1
Parasite, Asks
7 Basic, I
67 Parasite, **Bids**
4 Basic, 4
Parasites, **Bids**
4
Ln 4 Basic, 4
Parasites, Asks
2- Basic Dealers,
Bids
Basic Dealers,
0 Asks

0.00 0.50 1.00 1.50
Tick Size
FIG...

...8
F@n THE BIOS STOCK MARKET
La
FILE OPTIONS GRAPHS HELP
TIME: 57 BEST **BIDS** BEST OFFERS
UOTE MONTAGE
BIDS OFFERS 6i DEALER QUANT PRICE DEALER QUANT PRICE 60
CA
ci
NVZ 100 54 7...

...100 54 13/16 BDK 100 54 13/16 57 BDF 100 54 13/16 **BIDS** 100 54 13/16 56

BDK 100 54 13/16 BDB 100 54 13/16...

...TIME
EIDW 100 53 1/2 6i 1 00 53 112 - BEST OFFERS *ACTUI
-BEST **BIDS**
-MARKET OBSERVABLES TRUE VALUE
SPREAD: 3 5/16
VOLUME: 20.0 Fo-u
,T] FsTEP...

...0
SUBSTITUTE SHEET (RULE 26)
/33
La SET HUMAN DEALER PRICES
CASH: 3401.299 CURRENT **BID** : 53.8125 NEW **BID** : 53.8125
INVENTORY: 60.0 CURRENT OFF... 57.9375 NEW OFFER: 57.9375
RAISE QUOTES RAISE **BID** RAISE OFFER
LOWER QUOTES LOWER **BID** LOWER OFFER
FlGol 1A
SET TICK SIZE EID [91
SAVE
FlGol 1 B
SUBSTITUTE SHEET...

...THE BIOS STOCK MARKET
FILE OPTIONS I GRAPHS HELP
TIME SET HUMAN DEALER PRICES BEST **BIDS** /BEST OFFER
UO SET TICK SIZE
@SHOW TRUE VALUE 59
TRADE HISTORY OFFERS
DEALER QUANT...

...16
TIME
100 51 1/8 GDI 100 60 11/16 - BEST OFFERS AC'
- BEST **BIDS**
-MARKET OBSERVABLES - TRUE VALUE
SPREAD- 3 1/4
VOLUME- 5.0 RUN]
FQ
ulTl [STEPI...1 THE BIOS STOCK MARKET
La
FILE OPTIONS GRAPHS HELP
TIME: 90
UOTE MONTAGE BEST **BIDS** BEST OFFERS
65@
BIDS OFFERS
64
DEALER QUANT PRICE DEALER QUANT PRICE

63
BDE 100 57 BDY 100 59...

...100 63 66 68 70 72 74 76 78 80 82
TIME
BDG 100 56 **BIDE** 100 64 - BEST OFFERS *ACTUAL
-BEST **BIDS**
MARKET OBSERVABLES TRUE VALUE
SPREAD- 2
TEP RUN] [STOl
Fo -uT]Fs IF
VOLUME: 10...

...20
Fff-I THE BIOS STOCK MARKET
La
FILE OPTIONS GRAPHS HELP
TIME: 289 BEST **BIDS** /BEST OFFERS
UOTE MONTAGE 62
BIDS OFFERS
61
DEALER QUANT PRICE DEALER QUANT PRICE
cr
ri 60
NVD 100 56.5...

...277 281
TIME
BDE 100 55.38 BDE 100 62.38 - BEST OFFERS *ACTUAL
-BEST **BIDS**
-MARKET OBSERVABLES TRUE VALUE
SPREAD: 2.25
VOLUME: 6.0 RUN] [STOP
Fo-u,Tl...

...5 SELL 100 NVD 56.5 SELL 100 N)
FlGo21
AVERAGE MEAN SQUARED DIFFERENCE OF **BIDS** AND ASKS, AND TRUE VALUE
TICK MIXED MARKET WITH PARASITES 7 BASIC AND I NEWVOLUME 4 PARASITES AND
4 NEWVOLUME BAS[SIZE **BID** -TRUE ASK-TRUE VAL **BID** -TRUE ASK-TRUE VAL
BID -TRUE ASK-TRUE VAL **BID**
VAL
1.00 6 56 7. 18 2. 45 2. 27 2.92 2.66...

11/K/8 (Item 7 from file: 349)

Fulltext Availability:
Detailed Description
Claims

Detailed Description
... to know what is
the value of a specific object? For example, what is the
market value of a peanut? An economist would say that this is
an easy question. The value...See B.Widrow, N.Gupta &
S.Maitra, Punish/reward: learning with a Critic in adaptive
threshold systems, IEEE Trans. SMC, 1973, Vol. 5, p 465.)
- In any event, the BSA design...of "window" in time. He said that he
found that
the'-usual millisecond-or-so **sampling** time of the neocortex
actually contains only a 30-40 millisecond "window" for the
forward...t+l) - J(t) plus a local downstairs U(t) component
calculated at a higher **sampling** rate; the actual feedback may
involve derivatives of all these quantities. The local U(t...

Claim

... a real-time control
system, the interval between time t and time t+l (the **sampling** interval) may be very short. The literature on artificial intelligence has stressed the need to...are exact; by contrast, equation 32
involves the usual random disturbances associated with any statistical **sampling** method, without any real cost advantage.
1,4 From Passive Desi@jn to Active Desi...higher-level decision is made (based on this
maximization), we update Ji so as to **match** the target value of the right-hand side of this equation, which yields a backwards...the adaptation methods in the adaptive critic
literature, one can use -- in theory -- "almost any" **sampling** strategy which is mixed and diverse enough to eventually touch base with all relevant states...insert a neural network to receive as inputs i, A, anduA, and train it to **match** the targets given in equation 38. Instead of an integer "i," one would use r...

...a network which inputs r, A, u,,, and
J-,", and again to train it to **match** the targets implied by equation 39.
However, for a true neural network approximation, we cannot...1 In theory,
we could certainly merge the two networks into one network, trained to **match** the sum of the two targets; however, this is not the preferred variant of the...

...or some other supervised learning method able
to adapt such hidden layers) in order to **match** jAO (r) +jA1 (r).
This provides a kind of compression technique, similar to the "bottleneck...choosing
decision A in an initial state i. Note the importance of training JA' to **match** jBC+jH1 for the resulting state j, after the subsequent decision B is known; by...

...important in some cases.
Thirdly, the operations described above -- including the use of forwards results **sampling** in order to evaluate possible decisions and to train decision networks -- clearly require the existence...except of
course for itself. It would be trained by supervised learning, in order to **match** the goals g'- which are later developed by the following decision block, after the following...

...is used.
Actually, there are good reasons to weight this supervised learning, to try to **match** gl@ to g'- more energetically in some situations that in others. Higher weights should be...array of spatially-located
data, and also outputs an array of spatially located outputs (t7o **match** a spatially located array of targets).
There is a straightforward but novel generalization of that...brain: an engineering
interpretation. For reasons discussed therein, this system cannot operate at the maximal **sampling** rate which the underlying hardware seems capable of. In order to perform true maximal-rate...To take this process further, and develop a more serious second-order understanding of the **match** between ADP and specific connections and cell types in the brain, would require a substantial...particular task.
In practical applications today, computations are mainly based on discrete time cycles or **sampling** rates, rather than differential equations. In the discrete time formulation, tKi@re are& two related...style of

computation, with a high-speed inner recurrent loop embedded
within a lower-speed **sampling** system, in order to perform the
same task. For the maze problem, however, we were...weights were set by hand,
very arbitrarily; unfortunately, since we had problems seeding
the Unix **random number** generator.) This experience fits in
with a kind of Murphy's Law mentioned by Werbos...of such networks, it is important to
consider the clock rates of computation and data **sampling** . For
that reason, it is both easier and better to use error
minimizing designs based...not vice versa. To consider the functions
which an MLP can represent, we can simply **sample** a set of
randomly selected MLPs, and then test the ability of SRNs to
learn...

...picking Net A, we always used the same
feed-forward structure. But we used a **random number** generator
to set the weights. After Net A was chosen and Net B was
initialized...first three conditions, or which come a little closer to a
fifth desirable condition (to **match** all the specific cell
types in the brain in a comprehensive, testable manner), but
none...efficient
manner, and the cost of the computations can become a problem,
especially when millisecond **sampling** times are required.
The adaptive critic approach -- broadly defined -- is the
only type of design...in the brains of
vertebrates should try to meet.all three validation standards
-- it should **match** the neural circuitry, it should **match** the
existing behavioral experiments, and it must explain how the
brain achieves a very high...In the ANN
field, a generic system which learns to generate outputs Y(t)
which **match** some desired target values Y*(t), over time, is
called a "supervised learning system." But...where the set of random
numbers "noise" may either be simulated by use of a **random number** generator or deduced from an actual estimate of R(t).
We can try to adapt...lower-level adaptive critic
system. However, because the lower system is based on a higher
sampling rate, one would expect it to add in a few additional
components of utility, such...training signals to the cerebellum
from the olive do seem to involve a low-frequency **sampling**
rate (like that of the upper brain), even though the
cerebellum itself operates with an...definition of
utility (U); (2) an upper-level ADP system which operates on a
(clocked) **sampling** time on the order of 1/10-1/4 second; (3) a
lower-level ADP system which operates on an effective **sampling**
time on the order of 0.01 second. In other words, there is a
kind...